



Republic of Kenya

Arid Lands Resource Management Project (ALRMP) II



Annual Environmental Audit - 2006



ESF Consultants
Environmental Management Consultants



ACACIA CONSULTANTS LTD

Acknowledgement

First and foremost we would like to thank the staff of Arid Lands Resource Management Project in Nairobi particularly, Fatuma Abdikhadir, Mohammed Halakhe and Sam Wambugu. Their support contributed in many ways to make this study a success.

We also take the opportunity to thank, Saadia Noor and Ismael Duale Ahmed (Garissa), Mohammed Dahir (Ijara), Mbaruku and Wamae (Mbeere), Francis Koma (Mwingi) and Mr. Muthaura (Tharaka), Mr. Lordman (Isiolo), Mr. Abdikadir (Moyale), Mr. Wanjau (Moyale), Mr. Godana Doyo (Marsabit), Mr. Julius Muriuki (Laikipia), and Mr. Micheni (Nyeri) who took their time to provide assistance and valuable information making the completion of this study a reality. Similarly, we appreciate the assistance offered to us by Julius Akena, (Baringo) John Mwangi (Narok), Ann Olloolumbwa and her team (Trans-Mara) and Kariuki (West Pokot).

We are also indebted to the community members who contributed their experience in various projects that we audited in assessing their compliance. We thank these together with the many others who have not been mentioned here.



ESF Consultants



Acacia Consultants Ltd

This report was prepared by independent consultants with no previous involvement in the activities mentioned. Responsibility for the content and presentation of findings and recommendations rests with the audit team. The views and opinions expressed in the report do not necessarily correspond to the views of the Arid Lands Resource Management Project, Office of the Special Programmes, The World Bank, or the implementing organizations at the Districts.

Acronyms

AEZ	Agro Ecological Zone
ALRMP	Arid Lands Resource Management Project
ASAL	Arid and Semi Arid Lands
BOD	Biochemical Oxygen Demand
CDD	Community-Driven Development
COD	Chemical Oxygen Demand
CRS	Catholic Relief Services
DDC	District Development Committee
DMO	Drought Monitoring Officer
DSG	District Steering Group
EA	Environmental Audit
EIA	Environmental Impact Assessment
EMCA	Environment Management and Coordination Act
EMF	Environment Management Framework
EMP	Environmental Management Plan
EPHTPC	Eastern Province Horticulture and Traditional Food Crops Project
GoK	Government of Kenya
ICRAF	World Agroforestry Centre
IFAD	International Fund for Agricultural Development
JICA	Japan International Cooperation Agency
KEFRI	Kenya Forestry Research Institute
METs	Mobile Extension Team
MoA	Ministry of Agriculture
MoH	Ministry of Health
MoW	Ministry of Water
NEMA	National Environment Management Authority
OPEC	Organization of Petroleum Exporting Countries
PIP	Project Implementation Plan
PMU	Project Management Unit
PRSP	Kenya's Poverty Reduction Strategy Paper
SEA	Strategic Environmental Assessment
SLD	Support to Local Development
TDS	Total Dissolved Solids

CONTENTS

ACKNOWLEDGEMENT	1
ACRONYMS	2
EXECUTIVE SUMMARY	7
1.0 INTRODUCTION	16
2.0 SCOPE AND METHODOLOGY	16
2.1 PRE-AUDIT PLANNING	16
2.2 ON-SITE ACTIVITIES (INTERVIEWS AND INSPECTIONS)	17
2.2.1 <i>Natural Resources and Drought Management Component</i>	17
2.2.2 <i>Community Driven Development Component</i>	17
2.2.3 <i>Support to Local Development Component</i>	17
2.3 GATHERING AND EVALUATION OF AUDIT EVIDENCE	17
2.4 DEVELOPMENT OF AUDIT FINDINGS	17
2.5 RECOMMENDATIONS, DOCUMENTATION AND REPORTING OF THE FINDINGS	17
3.0 PROJECT DESCRIPTION	18
3.1 SPECIFIC PROJECT DESCRIPTION	20
3.1.1 <i>Ruungu Water Intake</i>	20
3.1.2 <i>Kiambindu Micro-Irrigation Scheme</i>	23
3.1.3 <i>Alango Arba Incinerator Project</i>	25
3.1.4 <i>Kikuyian Borehole</i>	27
3.1.5 <i>Olchorro Letuya Ole Tunya Spring</i>	29
3.1.6 <i>Chepareria Livestock Sale Yard</i>	30
3.1.7 <i>Kases Earth Dam</i>	32
3.1.8 <i>Kasina Earth Dam</i>	33
3.1.9 <i>Gababa Water Pan</i>	34
3.1.10 <i>Thirigitu Mt. Kenya Women Group</i>	35
3.1.11 <i>Trefos-Kiburuti Water Tank</i>	37
3.1.12 <i>Kaga Water Project</i>	39
3.1.13 <i>Gulley Erosion Control through Construction of Check Dams and Gabions in Sololo Mlimani</i>	40
3.1.14 <i>Walda Irrigation Project</i>	42
3.1.15 <i>Manyatta Jillo Primary School</i>	44
3.1.16 <i>Bubisa Primary School</i>	45
3.1.17 <i>Bubisa Water Project</i>	46
3.1.18 <i>Karungu Dam</i>	48
3.1.19 <i>Nkando Irrigation Project</i>	50
3.1.20 <i>Kilimani Primary School</i>	52
3.1.21 <i>Bula Mpya Primary School</i>	54
3.1.22 <i>Bula Pesa Bridge</i>	56
3.1.23 <i>Olmelil Dam Rehabilitation and Spring Protection</i>	57
3.1.24 <i>Chemsik Pan Rehabilitation</i>	59
3.1.25 <i>Excavation of Temburion Water Pan</i>	60
4.0 BASELINE ENVIRONMENT	62
4.1 PROJECT ECOLOGICAL ZONES	62
4.1.1 <i>Climate</i>	62
4.1.2 <i>Livelihoods</i>	63
4.1.3 <i>Soils</i>	63
4.1.4 <i>Demography/ Population</i>	63

4.2 DISTRICTS PROJECT AREAS	64
4.2.1 Mbeere District	64
4.2.2 Isiolo District	65
4.2.3 Marsabit District	65
4.2.4 Mwingi District	66
4.2.5 Nyeri District	66
4.2.6 Baringo District	67
4.2.7 Narok District	68
4.2.8 Ijara District	68
4.2.9 Garrissa District	69
4.2.10 Moyale District	69
4.2.11 Laikipia District	70
4.2.12 Tharaka District	71
4.2.13 West Pokot District	72
4.2.14 Trans mara District	72
5.0 INSTITUTIONAL, POLICY AND LEGAL FRAMEWORK	74
5.1 ENVIRONMENT MANAGEMENT AND COORDINATION ACT 1999	74
5.2 THE WATER ACT 2002	75
5.3 THE AGRICULTURE ACT	75
5.4 THE FOREST ACT	75
5.5 PUBLIC HEALTH ACT CAP 242	76
5.6 THE LAND PLANNING ACT	76
5.7 PHYSICAL PLANNING ACT	76
5.8 DRAFT NATIONAL POLICY FOR THE SUSTAINABLE DEVELOPMENT OF ASAL OF KENYA 2005	76
5.8.1 ASAL Vision and Strategy	77
5.9 FOREST POLICY	78
5.10 SESSIONAL PAPER No. 6 OF 1999 ON ENVIRONMENT AND DEVELOPMENT	78
5.11 THE WORLD BANK'S ENVIRONMENTAL AND SOCIAL SAFEGUARD POLICIES	81
5.12 SESSIONAL PAPER No. 1 OF 1986	82
5.13 LAND TENURE SYSTEMS	82
5.14 DRAFT NATIONAL LAND POLICY	83
6.0 ENVIRONMENTAL MANAGEMENT PLAN	85
6.1 MONITORING AND EVALUATION PLAN	102
7.0 STUDY FINDINGS	103
7.1 INSTITUTIONAL CAPACITY	103
7.2 ENVIRONMENTALLY SOUND PROJECT DESIGN AND SITING	103
7.3 USE OF ENVIRONMENTAL SCREENING FORM	103
7.4 ADVERSE ENVIRONMENTAL IMPACTS	104
7.5 NATURAL RESOURCE MANAGEMENT AND DEVELOPMENT	104
8.0 STUDY RECOMMENDATIONS	105
8.1 TRAINING AND CAPACITY BUILDING ON ENVIRONMENTAL ASSESSMENT AND MANAGEMENT	105
8.2 ENVIRONMENTALLY SOUND PROJECT DESIGN AND SITING	105
8.3 USE OF ENVIRONMENTAL SCREENING FORM	106
8.4 MITIGATION OF ADVERSE ENVIRONMENTAL IMPACTS	106
8.5 NATURAL RESOURCES DEVELOPMENT AND MANAGEMENT	107
8.6 FURTHER STUDIES	107
9.0 PROJECT BEST PRACTICES GUIDE	108
REFERENCE	131

APPENDIX.....	133
A. TRAINING CURRICULUM	133
<i>Training of Trainers course on integrating environmental awareness into project activities</i>	133
<i>Integrating environmental management into drought preparedness projects</i>	135
B. ENVIRONMENTAL REVIEW SCREENING FORM	137
C. TERMS OF REFERENCE	139
D. CONTACTED PERSONS	141
E. WATER SAMPLES RESULTS.....	143

List of Plates

Plate 1. Kiambindu irrigation project	24
Plate 2. The incinerator at Alango	26
Plate 3. Gababa water pan	35
Plate 4. Furrow from upstream to the Project site	36
Plate 5. A section of dry river Nairobi silted due to anthropogenic activities upstream.....	37
Plate 6. One of the open tanks still under construction	38
Plate 7. One of the depressions around the water tank.....	39
Plate 8. A section of a trench next to the tank	39
Plate 9. Gabions on water course from Borolle Hills	41
Plate 10. A water tank at Walda	42
Plate 11. A plot of healthy crops under pipe irrigation at Walda Project area	43
Plate 12. The Two Classrooms constructed by ALRMP II in Manyatta Jillo.....	44
Plate 13. A section of Manyatta Jillo School Compound.....	44
Plate 14. The two classrooms constructed by ALRMP II in Bibisa	45
Plate 15. A roof supported using building blocks	46
Plate 16. Bubisa Water Project	47
Plate 17. The Generator used to pump water.....	47
Plate 18. Bare project area with distant vegetation.....	48
Plate 19. Background view of the dam's inlet catchment	49
Plate 20. Bare land with construction material remains at the project site	49
Plate 21. Water intake point from River Likii	50
Plate 22. The storage tank	50
Plate 23. Bottle-brush trees at the tank site	51
Plate 24. A wall slab of the two classes constructed by ALRMP II.....	52
Plate 25. A section of Kilimani school compound	53
Plate 26. A leaking water tank behind the classes	53
Plate 27. One of the dust affected classes	54
Plate 28. A picture of current Bula Mpya Primary School	54
Plate 29. The new school under construction	55
Plate 30. Example of water storage pits that have been left open.	55
Plate 31. The Bula Pesa Bridge.....	56
Plate 32. Stones packed on one side of the bridge to control the gullies.....	57

List of figures

Figure1. A Map showing the Districts that were visited	19
Figure 2. ASAL Districts Classified by Extent of Aridity	62
Figure 3 Safeguard policies	81

Executive Summary

Arid Lands Resource Management Project Phase II (ALRMP II) is the second phase of the phase I of the ALRMP that was initiated in 1995 by the Government of Kenya (GoK) with support from the World Bank.

The goal of the ALRMP II is to foster economic growth and reduce poverty within the framework of Kenya's Poverty Reduction Strategy Paper (PRSP). The project's development objective is *to enhance food security and promote sustainable livelihoods through effective systems and structures that reduce vulnerability*.

As a requirement by the Kenya's national environmental regulations provided for in the Environmental Management and Coordination Act (EMCA) and as stipulated in the ALRMP II Environmental Assessment and Management Framework (EMF) document, the several projects in the ALRMP II must be subjected to Annual Environmental Audits (EA) and evaluation¹.

This is the final report of Arid Lands Resource Management Project (ALRMP) phase II Annual Environmental Audit that was undertaken by a consortium of Environmentalistes Sans Frontieres (ESF) and Acacia Consultants. The report highlights the projects compliance status in relation to the Kenya's environmental legislative framework and the World Bank's environmental and social safeguard policies as well as impacts (beneficial and adverse) of the projects and eventually details a comprehensive Environmental Management Plan for addressing and mitigating the adverse impacts identified.

The report also contains a detailed and comprehensive Best Practice Guidelines that can be used by the district staff when developing and implementing projects of similar nature. These guidelines should evolve as we learn new ways of planning and executing community micro projects.

The aim of this study was to assess the compliance of ALRMP II projects to World Bank's Environment and Social Safeguard Policies and to the Kenya's environmental management regulations as provided for in the Environmental Management and Coordination Act (EMCA). To achieve this, the consultants reviewed in detail the performance of the ALRMP II in integrating natural resources and environmental management and mitigation measures into the operations of the project, and made practical recommendations for improving performances, ensuring and recording compliance monitoring, identifying cumulative effects and providing learning lessons for continuous performance improvement.

Due to the wide scope of the project, random sampling of all the micro projects was used in the selection of specific projects to be subjected to environmental audit. The sampling considered the diversity of the projects to be included in the study so as to have a wide range of projects assessed from different categories. The existing Environmental Management Framework (EMF) document and the previously undertaken Environmental Audit (EA) report (by ANECT Consultants) and Case Study reports of the projects was also used as a screening checklist of projects with potential impacts.

Selection of projects to be audited was based on geographical distribution, project diversity, and projects identified in the EMF with potential impacts and sensitivity of the project on environment. The projects audited in this study included water pans, livestock holding pens, earth dams, school construction, spring protection, borehole drilling, irrigation projects, pit latrines construction, incinerator, and restocking. Out of 22 districts participating in the project, 14 districts (Moyale, Garissa, Ijara, Mwingi, Tharaka, Mbeere, Kieni, Narok, Isiolo, Marsabit, Laikipia, Baringo, West Pokot and Trans Mara) were included in the study

¹ Environmental Management Framework is used throughout this report as a shorter alternative to the phrase Environmental Assessment and Management Framework.

representing a total of 22 projects. However other districts were earlier audited in the previous year. The projects audited were;

1. Ruungu Water Intake
2. Kiambindu Micro-Irrigation Scheme
3. Alango Arba Incinerator Project in Garissa
4. Kikuyian Borehole
5. Olchorro Letuya Ole Tunya Spring
6. Chepareria Livestock Sale Yard
7. Kases Earth Dam
8. Kasina Earth Dam in Mwingi
9. Gababa Water Pan in Ijara
10. Thirigitu Mt. Kenya Women Group in Kieni East
11. Trefos-Kiburuti Water Tank in Kieni East
12. Kaga Water Project in Kieni West
13. Gulley Erosion Control through Construction of Check Dams and Gabions in Sololo Mlimani, in Moyale
14. Walda Irrigation Project in Moyale
15. Manyatta Jillo Primary School in Marsabit
16. Bubisa Primary School in Marsabit
17. Bubisa Water Project in Marsabit
18. Karungu Dam in Laikipia
19. Nkando Irrigation Project in Laikipia
20. Kilimani Primary School in Isiolo
21. Bula Mpya Primary School in Isiolo
22. Bula Pesa Bridge in Isiolo

Environmental Audit Findings

The findings of this study is structured into sections that gives a summary of the numbers of the micro-projects and inter-community projects undertaken in the study districts, the number of projects screened for environmental impacts, projects that were provided with technical advice from METs and those that were subjected to a full EIA.

The environmental findings also describes the actual operation of the EMF as it applies in the field, identifies environmental risks that are not being fully addressed or mitigated and provides conclusions on whether the project is maximizing its positive contribution to natural resources and environmental management and suggests areas of improvement and practical recommendations.

Arid Lands Resource Management Project has improved household's food security, school facilities, provided domestic and agricultural water sources, and opened up traditionally inaccessible areas as well as harnessed community contribution in local development. Although this statement cannot be quantified in this report, the sentiments at the communities visited have the life experiences of life before and after the project commenced.

Total Projects implemented Output in the Study Areas

Based on the findings of the study, a total of was undertaken in the 14 districts. This were as follows

Summary of the numbers of the micro-projects and inter –community projects

- i. A total of 202 were implemented during the audit year.
- ii. Of the projects implemented 184 were micro projects while 18 were intercommunity projects

- iii. All the projects implemented were subjected to environmental screening apart from three projects
- iv. Three projects underwent Environmental Impact Assessment study before implementation however the report cannot be traced at the district office
- v. One project out of the projects implemented did not get technical advice from METs

All the projects implemented save for the incinerator in Garissa District sort technical advice from METs and line ministries in designing of the project.

Kiambindu Irrigation Project in Tharaka, Kerinkani dam in Trans Mara and Kases dam in West Pokot undertook an independent environmental assessment however we could not trace the reports of the EIA

The District teams use the Environmental Management Framework as a guide in assessing environmental impacts and impact monitoring as well as in project screening. However from the discussions with METs it emerged that the EMF is generic in nature and lacks the guidelines on how to identify impacts and best practices in project design

Environmental checklist from the EMF was also applied in identification of project impacts and based on the results of the checklist an Environmental Management Plan was designed.

All the projects audited had Environmental Management and Monitoring Plan that had been developed by the district teams.

Project positive contribution to natural resources and environmental management

ALRMP is contributing to socioeconomic welfare of most of the project areas that were visited during this study. However it came out clearly that NRM and environmental management in these areas has not achieved the desired goals. This can be attributed to lack of interest in the face of drought and other emergencies in ASALs during 2005-2006 financial year.

Most of the personnel at the district level are inclined towards drought management and community development components project. This is either by default or by design of the project.

The ALRMP has contributed to natural resource and environmental management in the ASALs in tow folds. First is at the national strategic level where policy on ASALs has been developed and awaiting approval. This policy will help in sustainable development and management of ASALs natural resources and environment through investment projects and land tenure

The second fold is the contribution of ALRMP to local and regional natural resource management of ASALs through community based developments that target natural resources and capacity building of local communities in natural resource management, drought management and mitigation and support to local development

Another strategic impact of the project is possible achievement of food security and reduced vulnerability of the ASALs communities to drought. This relates to the number of irrigation projects implemented, source of water developed to date and restocking of livestock to households that lost their source of livelihood during the last drought

The project has also improved local level coordination amongst the stakeholders including civil society integration in government development agenda.

All the Districts teams have up to date documentation of screen forms for the projects under their jurisdictions. However there is lack of criteria of establishing what projects should undergo a full EIA and which ones are to be screened.

Summary of Environmental Risks

The study has identified two kinds of environmental impacts that can be triggered by ALRMP activities or projects.

The first one is localised impacts that are as a result of pressure on resources such as cattle trampling and overgrazing near water sources such as those supported by ALRMP like pans and dams.

The second kinds of impacts are those that are cumulative in nature caused by numerous micro-projects depending on the same kind of resource. The activities that have such impacts include groundwater abstraction projects and surface water abstraction. For example cumulative impacts of waterways weirs on downstream water users have not been assessed to ascertain impacts of these projects on the communities downstream.

Irrigation projects impacts on soil fertility and efficiency is also another risks that need an in depth assessment/analysis over time to determine the cumulative and long term impacts on arid soils

The case of water pans contributing to waterborne diseases and as a breeding ground for malaria carrying mosquitoes has not been fully studied and appreciated

For example cumulative impacts of waterways weirs on downstream water users have not been assessed to ascertain impacts of these projects on the communities downstream.

Irrigation projects impacts on soil fertility and efficiency is also another risks that need an in depth assessment/analysis over time to determine the cumulative and long term impacts on arid soils

It is alleged that water pans constructed have resulted in increase in water related diseases such as bilharzias, diarrhoea and cholera. Also that the pans have led to increase in mosquitoes in the areas thus resulting in increased malaria prevalence. However this assumption cannot be tied to pans development as no study has been undertaken to support this.

From observation, availability of water pans has led to increase in concentration of livestock near the water points thus leading to de-vegetation around the pans, soil erosion and contamination of the pans through livestock droppings.

In areas like Ijara district where use of pit latrines is not common, water pans are likely to be polluted by human waste during rainy season as most of the waste is washed into the pans. This has led to increase in waterborne diseases.

Waterworks in some streams/rivers over time is resulting in river damming

Improvements and Practical Recommendations

Training and Capacity Building at National and District institutions

For the DSG to be effective in natural resource and environmental management the National level staff need capacity building in these areas. The effect of the institutional and capacity building through training and strengthening of the national level staff would trickle down to the DSG

Most of the District Steering Groups (DSGs) have not had any form of training and capacity building in the following areas which remain vital in implementing environmental components of the projects namely:

- Environmental Impact Assessments
- Environmental Audits
- Monitoring and Evaluation
- Use of the Environmental Screening Form

The communities especially the management committees lack the necessary capacity in simple financial, management, conflict resolution and environmental issues. This is a vital ingredient especially in the CDD type of projects that are fully managed by the communities.

The proposed position of environmental mitigation officer as indicated in the project implementation plan should be recruited to provide backstopping to the district teams.

Environmentally Sound Project Design and Siting

There is a lot of water going to waste through evaporation as a result of irrigating farms during day time when the sun is shining due to poor design.

Most irrigation projects use inefficient technologies that waste water through ground seepage and evaporation owing to poor design.

Poor siting of pit latrines could cause underground water contamination especially when near a water source or borehole as is the case with the Narok borehole project.

Use of Environmental Screening Form

Based on the review of paper trail of screening and EMP, impacts of micro projects are not identified but mitigations are recommended.

While the EMF identifies the need to assess and monitor cumulative impacts of micro project at regional level, there is no evidence at the field level of this happening.

The DSG has reported cases where the Screening Form is too generic and unable to comprehensively address all the issues related to the projects at the local situation and on the ground. Therefore a new friendly and adaptable screening checklist should be established based on the Best Practice guidelines appended in the report. The Best Practice guidelines is not an end to itself but should be improved as new lessons are learnt from the field teams

EMP should be established before communities are handed over projects and they should be trained on it

Adverse Environmental Impacts

All the water weirs projects audited none has a master meter to monitor the amounts of water abstracted. This in some places has resulted in downstream water users to have low volume flow due to uncontrolled abstraction upstream.

The boreholes that are powered by diesel to run the generator sets lack a comprehensive plan for managing the waste oil emanating from the generators. This is immensely becoming a potential hazard especially in relation to how the waste oil can be disposed in an acceptable and environmentally sound manner.

Most of the water projects constructed for human consumption have not been subjected to the mandatory tests on water including COD, BOD, and heavy metals etc as required. The water projects need to

categorically get subjected to these tests before handing over to the communities. A sample of analysis of water samples from selected water projects are appended

It is alleged that water pans constructed have resulted in increase in water related diseases such as bilharzias, diarrhoea and cholera. Also that the pans have led to increase in mosquitoes in the areas thus resulting in increased malaria prevalence.

From observation, availability of water pans has led to increase in concentration of livestock near the water points thus leading to de-vegetation around the pans, soil erosion and contamination of the pans through livestock droppings.

In areas like Ijara district where use of pit latrines is not common, water pans are likely to be polluted by human waste during rainy season as most of the waste is washed into the pans. This has led to increase in waterborne diseases.

In cases where weirs are constructed, the study found out that hardly is an environmental impact assessment done to determine the impacts of the weir and water abstraction on downstream users. This can result in some cases loss of livelihoods and water use conflicts to communities downstream.

Based on the findings of this study, it has emerged and become apparent that ALRMP II has to a great extent been complying with the EMF document designed during the project planning phase and made available to the District Steering Group (DSG). The study has however identified certain issues that require attention towards ensuring Environmentally Sound Design, Management and Compliance.

Recommendations

Based on the study findings we have proposed several measures that would aim at improving the beneficial impacts of the project in the ASALs and improve project compliance to the World Bank's environmental and social safeguards as well as the Kenya's environmental legislative framework. The recommendations proposed below are as a result of consultation with the project implementation team in the districts and the community involved. The recommendations are summarised in this section but a comprehensive and detailed recommendations are found in the EMP section of this document.

Training and institutional capacity building on Environmental Assessment and Management

It is strongly recommended that the training and capacity building in the following areas be accorded to the ALRMP District Steering Group and the Project Management Unit. The study has found out that staffs from the DSG and PMU are not trained on undertaking Environmental Assessment and ensuring compliance and in effect they have weak capacity for environmental management at the districts. This is in the overall effect compromising the quality of the screening forms that they are supposed to fill. Training of the DSG and PMU in the following areas is therefore recommended namely:

1. Environmental Impact Assessment for CDD type of projects
2. Environmental Auditing for CDD type of projects
3. Participatory Environmental Monitoring and Evaluation for CDD type of projects
4. Environmental Management and Coordination Act
5. Environmental Screening

The local communities implementing the projects also need capacity building on environment and in areas of conflict resolution among others. Specific training in the following areas is required for the local communities namely:

1. Awareness and sensitisation on the EMCA and general environmental issues
2. Training on simple book keeping and financial management
3. Training on conflict resolution
4. Training on Organisational Development and Group dynamics.
5. Training on Participatory Monitoring and Evaluation

Capacity of communities implementing water related projects should be enhanced so as to enable them form effective Water Users Associations/River Users Association and provided for in the Water Act. Training of the communities on routine operation, repair and maintenance of the generator plants is also highly recommended. It is also important to note that in order to enhance effective capacities of staff at both national and district levels, there should be organised exchange visits between districts to ensure the sharing as well as borrowing of experiences especially for the successful projects and activities.

While CDD, Drought Management and SLD components have adequate field personnel, NRM component lack field personnel and only depend on poorly equipped NEMA personnel to provide technical advice in some of the projects that have significant environmental impacts. It's highly recommended that for this phase more NRM component personnel be recruited to provided the much needed technical advice for ASAL environment.

Its also the recommendation of this study that the national and district level staff undergo environmental management and natural resource management reorientation training to boost their capacity in integrating NRM in other project components.

National Environment Management Authority (NEMA) role should be strengthened to enable the DEOs to provide technical backstopping to ALRMP during design, implementation and monitoring.

The project needs an NRM officer at the district level or regional level.

Environmentally Sound Project Design and Siting

The environmental audit study has ascertained that some of the adverse environmental impacts experienced from the ALRMP II are as a result of poorly thought out design and siting of the projects that do not factor in environmental concerns at the design stage. For this reason there is need to ensure and incorporate Environmentally Sound Design of projects at the design stage to avert potential adverse impacts. For example:

- During the design stages of the community projects, the technocrats at the district level should aid the community in the designing of the projects to improve the efficiency
- To improve the efficiency of the incinerator in Garissa for example, redesigning is necessary. A second chamber should be included and aeration chamber be introduced.
- The pit latrine in Narok was poorly sited and if ESDM was applied then the pit latrine would have been properly sited to avoid possible contamination of underground water.

Use of Environmental Screening Form

The environmental audit study has found out that the already designed environmental screening form is not being filled by ALRMP II staff and the DSG as required. The study has realised that because the form provides for simply checking off and answering YES or NO, the form is generally abused with several instances where the form is simply filled as NO. Training in providing intellectual depth while filling the forms by the DSG is vital and needs to be embarked upon with immediate effect.

The environmental screening form is too generic and borders more on the identification of the bio-physical effects to the expense of the socio-economic impacts. The screening form should be customised to suit the needs of the community micro projects undertaken in the field. In order to achieve this, a consultative forum of field staff should be involved to review and customise this form as they have the hands on experience with what can work and what cannot work. Already some districts like Narok and Garrissa have customised the form while ensuring that the key requirements and objectives are not altered.

Mitigation of Adverse Environmental Impacts

The study has identified a number of adverse impacts from the several projects audited and has proposed the following mitigation measures.

Irrigation Canals and Water Abstraction Project

There is need to complete the lining of the planned section of the open canal to reduce the imminent seepage of water that is causing wastage.

Irrigation of crop irrigation should be undertaken when there is least loss of water through evaporation to reduce loss of water and increase efficiency of the system. Watering should for example be shared from 4pm to 8pm and from 5am to 9 am to reduce the amounts lost through evaporation.

Water rechanneling canals should be constructed in the irrigation canals to redirect the excess water back to the river. This will prevent the perennial problem of flooding of the roads and adjacent lands.

For water abstraction projects/weirs, there is need for all the projects to have a master metre installed at the intake to measure the amount of water being abstracted. This is more so a requirement by the Ministry of Water and Irrigation.

There is need to grow soil holding crops close to the open furrows e.g. Napier grass and sugar cane to cut down on siltation rate which compromises the overall performance of the furrow system and increases the need for dredging.

To prevent loss of vegetation cover and soil erosion around the water pans, fencing of the pans using local shrubs or vegetation is highly recommended. Distribution of pans could also help alleviate the problem of overgrazing and devegetation around water pans.

Before commissioning construction of weirs on rivers and streams, an environmental assessment should be undertaken to determine the impacts of the project on other water users downstream.

To improve the project response to environmental and natural resource management, other components of the project, i.e. CDD, SLD and Drought Management components should integrate NRM activities to ensure sustainability of these other components. In emergency situation such as drought, a Rapid Environmental Assessment in Disasters should be undertaken.

Natural Resource Management component should be encouraged and promoted as a long term projects that will address problems that are addressed by these other components in the short tem.

Lessons Learnt

The most important lesson is that environmental management in ALRMP II can only succeed if integrated in other development projects that have socio-economic impacts on the livelihoods of the communities

Another lesson, which follows from this, is that by focusing on rural livelihoods, the interventions meet the needs of local communities because they are directly involved in defining them.

A further lesson learnt is that for environmental sound design of ALRMP to succeed, technical input of the relevant line ministries is necessary.

There is need for Strategic Environmental Assessment (SEA) for Districts Strategic Plans, ASALs policy and Arid Lands Resource Management Project Strategic Plan to assess the environmental implications of the plans and policy on the fragile and not well understood ASALs

The most negative lesson learnt was the weak/inadequate natural resource management (Environmental Management) approach in most of the projects audited. Even though paper trail shows screening of projects, that's in most cases tend to be the end of environmental management.

There is need to improve coordination between the ALRMP at the district level and the line ministries personnel. While the line ministries provide technical advice to ALRMP, in some cases records are not filed by the ALRMP office making it cumbersome to trace paper trails on technical issues like water sampling and testing and environmental assessment reporting.

Through addressing community present needs can many a times cause unforeseeable adverse impacts on the resource base that might eventually lead to more suffering by the community in the long term. While alleviating community problems it's important to attempt to mitigate long term impacts of the project.

Assumptions that NRM issues will be integrated into development agenda is not working without putting in place strategies/mechanisms and resources to mainstream NRM in the development projects. In the case of the ALRMP, the NRM component is assumed will be applied across board the other components of the project without having adequate personnel and training. Using the DSG diversity especially in NRM field has not reinforced the performance of the NRM. As such there is need to strengthen the NRM component through capacity building, additional personnel and reorientation of the project personnel on environmental management for the sustainability of the project.

Identifying and mapping of natural resources (water, pasture, forests, etc) in drought-prone areas is an important step towards developing knowledge bases that can be used for mitigation adverse environmental impacts and emergency response planning.

1.0 Introduction

This study was commissioned by Arid Lands Resource Management Project phase II of the Office of the President as part of the requirements of the project's environmental management framework and EMCA. The study is an environmental audit for selected districts under the project. The study was carried out in fourteen districts to determine how far the projects activities and operations conform to the approved environmental standards as per the regulations of the Environmental Management and Coordination Act and World Bank social and environmental safeguard policy.

Arid Lands Resource Management Project II (ALRMP II) builds upon the first Arid Lands Resource Management Project (ALRMP), which is closed on June 30, 2003. The first phase ALRMP objective was to build the capacity of communities in the Arid Districts of Kenya to better cope with drought. The project has three components: 1) The Natural Resources and Drought Management Component aims to mitigate the risk posed by drought and other factors by strengthening and institutionalizing natural resources and drought management systems. This in turn will reduce the vulnerability of the population in an area which is characterized by frequent, acute food insecurity related to drought. 2) The Community-Driven Development (CDD) component will foster development capacity at the community level and below to empower communities to take greater charge of their own development agenda and take responsibility for the development choices made. The component activities build upon the significant capacity created during the first phase and strengthen existing institutions, as well as expand to other communities in the same districts to achieve broad coverage and to create new CDD implementation capacity. 3) The Support to Local Development Component aims to foster a conducive enabling environment in the arid lands to allow the population to break out of the prevalent survival-relief continuum into a positive development agenda leading to economic growth and reduced dependence on outside intervention.

2.0 Scope and Methodology

This study covered the three components of the ALRMP II and involved site visits sampled from Arid Lands Resource Management Project phase II. The 14 districts covered in this audit are namely Moyale, Garissa, Ijara, Mwingi, Tharaka, Mbeere, Kieni, Narok, Isiolo, Marsabit, Laikipia, Baringo, West Pokot and Trans Mara districts respectively.

The study audited selected ALRMP II projects and operations together with associated activities to identify any adverse impacts on the environment and level of compliance to the national environmental standards as well as to World Bank's operational policies and procedures on environment. The exercises also sought to design actions to mitigate residual impacts through strengthening and/or designing of an Environmental Management Plan (EMP) for all the projects audited.

The objective of this study was to;

- Review that performance of the ALRMP II in integrating natural resources and environmental management and mitigation measures into the operation of the project, and make practical recommendation for improving performances
- Ensure and record compliance monitoring
- Identify cumulative effects
- Provide learning lessons for continuous performance improvement.

2.1 Pre-audit planning

The consultants undertook an inventory of the available project reports and document of ALRMP including Environmental Assessment Management Framework, Districts Environmental Management Plans, Screening checklist reports, Project Situational Analysis Report of completed micro projects, Case Studies

Report 2003-2005, Strategic Plan, Environmental Audit report 2005, Project Implementation Plan (PIP), Kenya ASAL Policy, Project Implementation Report, National Vision and Strategy Report.

2.2 On-Site activities (interviews and inspections)

During the pre audit planning, samples of the projects to be visited were identified. The projects selected and finally audited have been divided into the 3 components and include;

2.2.1 Natural Resources and Drought Management Component

Under this component, the following projects were lined for auditing based on the prior EMF and screening checklist.

- Nkonkorin water pan in Narok
- Chesanayan water pan in Baringo
- Sasak sand dam in Sasak West Pokot
- Lolgorian water project in Trans Mara
- Desilting of Kasina dam in Mwingi

2.2.2 Community Driven Development Component

Projects that participated in this study under this component were

- Mosiro pump feed irrigation scheme-Mosiro location in Narok
- Kiambindu micro irrigation project in Mbeere District
- Gababa water pan in Ijara District
- Construction of Ruungu water intake in Tharaka
- Kikuyian Borehole

2.2.3 Support to Local Development Component

- Construction of incinerator at Alango in Garissa
- Kilimani Primary School in Isiolo
- Bula Mpya Primary School in Isiolo
- Bula Pesa Bridge in Isiolo
- Manyatta Jillo Primary School in Marsabit
- Bubisa Primary School in Marsabit
- Chepareria Livestock Sale Yard

2.3 Gathering and evaluation of audit evidence

Gathering of information on assessment of compliance and non compliance of impacts was undertaken in this section. Identification of impacts and those activities that cause the impacts were identified and pinpointed during and after field visits.

2.4 Development of audit findings

A desktop compilation of the findings of the study was undertaken based on the information gathered in the field and review of projects documents

2.5 Recommendations, documentation and reporting of the findings

Appropriate recommendations were developed based on the findings of the audit. These findings informed the basis for mitigation measures to be applied, further studies to be undertaken, Best Practices to be used in the implementation of activities.

3.0 Project Description

Arid Lands Resource Management Project Phase II is made up of three components namely, Natural Resources and Drought Management Component, Community-Driven Development (CDD) and Support to Local Development Component.

The Natural Resources and Drought Management Component aims to mitigate the risk posed by drought and other factors by strengthening and institutionalizing natural resources and drought management systems. This in turn will reduce the vulnerability of the population in an area which is characterized by frequent, acute food insecurity related to drought. Some of the projects that fall in this component include:

- Construction or rehabilitation of water harvesting structures such as water pans
- Roof and rock catchments
- Construction or rehabilitation of water dams and water storage constructions;
- Protection of springs
- Construction, rehabilitation or equipment of boreholes
- Construction, rehabilitation or equipment of wells
- Construction, rehabilitation of water supply system
- Protection of natural resource base through construction works such as terraces, local forestry, indigenous soil and water conservation systems
- Support to emergency off-take of livestock (making it more attractive for people to sell animals)
- Emergency food, water and seed provision; and
- Emergency human and animal health vaccination campaigns.

The Community-Driven Development (CDD) component is to foster development capacity at the community level and below to empower communities to take greater charge of their own development agenda and take responsibility for the development choices made. The component activities build upon the significant capacity created during the first phase and strengthen existing institutions, as well as expand to other communities in the same districts to achieve broad coverage and to create new CDD implementation capacity.

Projects under this component are construction or rehabilitation of day schools, construction or rehabilitation of dispensaries, construction or rehabilitation of community halls, provision of school books, desk, etc. to schools, spot improvements to roads, bridges etc, construction of shelter for internally displaced persons; construction or rehabilitation of water harvesting structures such as water pans and roof catchments; construction or rehabilitation of shallow wells, re-stocking with animals, replacement of small irrigation pumps & drip irrigation kits, support of farmers with improved crop husbandry practices (capacity building), support women groups with their effort to increase their working capital for trade, construction or rehabilitation of guest houses as an income-generating activity; and support communities with development of other income generating activities such as apiculture, small scale hides & skins processing, small –scale

The Support to Local Development Component aims to foster a conducive enabling environment in the arid lands to allow the population to break out of the prevalent survival-relief continuum into a positive development agenda leading to economic growth and reduced dependence on outside intervention. Activities under this component will include the following:

- Support to service delivery (health, education, agricultural, animal health etc.)
- Fostering of the development and strengthening of rural financial institutions (savings and credit)
- Support to marketing initiatives (especially livestock marketing through Kenya Livestock Marketing Corporation)

- Support to natural resource management activities and mechanisms;
- Critical infrastructure, including roads, water infrastructure, and communications infrastructure
- Support to conflict resolution mechanisms ,in collaboration with pastoral Associations and other stakeholders
- Research and studies targeted at specific identified problems, with practical outputs, e.g. training manuals, and dissemination material.

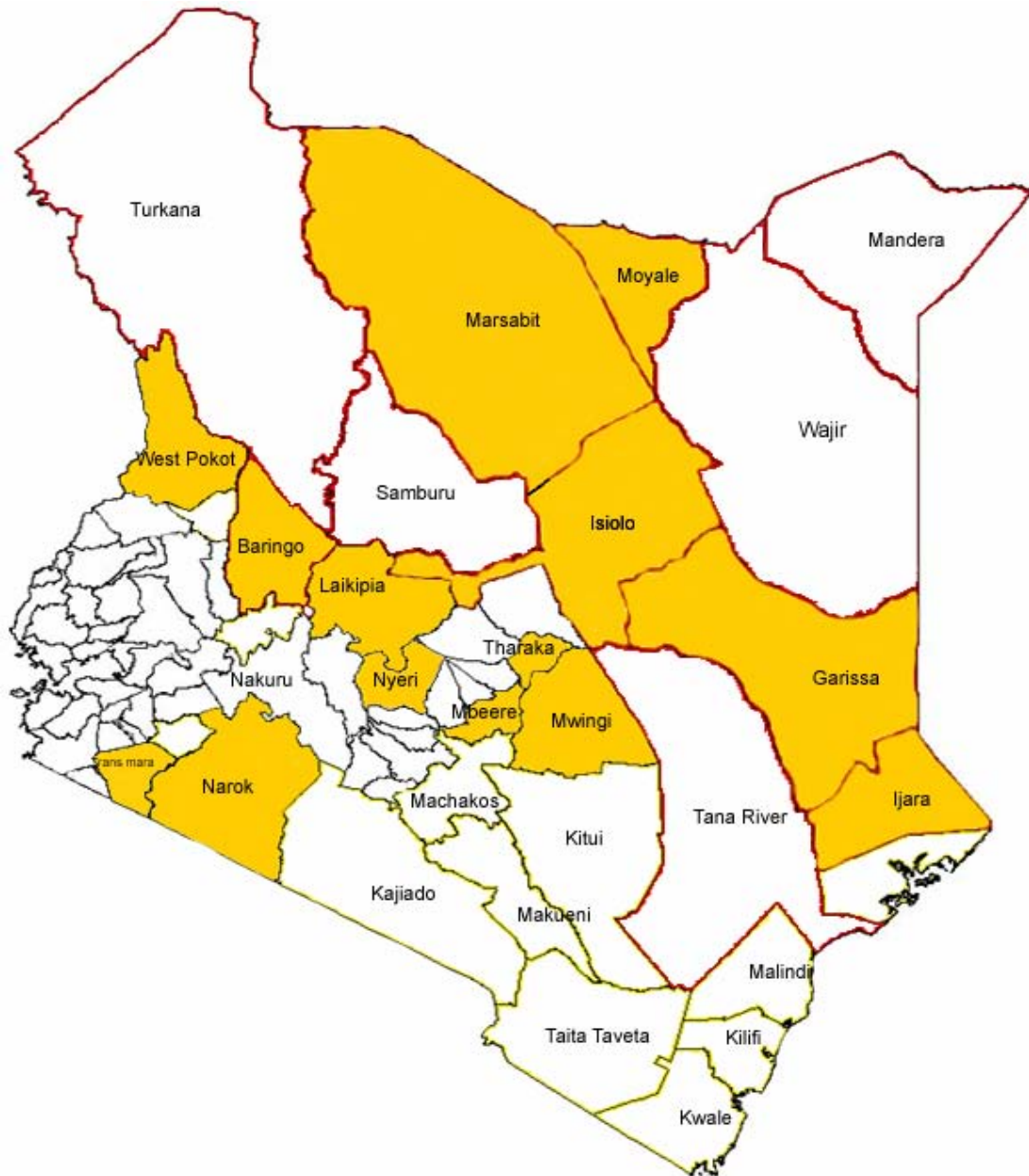


Figure1. A Map showing the Districts that were visited

3.1 Specific Project Description

3.1.1 Ruungu Water Intake

Project Background

Ruungu irrigation scheme is situated in Karocho Sub location, Tirima location, Central Tharaka division of Tharaka District. It is situated about 50 Kms south east of Meru town and approximately 240 Kms from Nairobi. It is served by an earthen rough road from Nkubu with the section Nkubu and Mitunguu murram (17Kms). Nkubu town is about 37 Km from the scheme. The road from Nairobi to Nkubu is tarmacked.

The climate of the project area is mainly influenced by its position in respect to Mount Kenya. Its geographical position with respect to the equator and the monsoon influences of the Indian Ocean. The climatic station closest to the project area is Marimanti with an altitude of about 610 metres above sea level, where as that of the scheme area is about 800 metres. The climatic data for Mitunguu scheme which is at an altitude of 1189 metres above sea level and which is also closest to the scheme area could be adopted as being representative of Ruungu scheme climate. The rainfall pattern is bimodal.

The soils within the scheme are soils on lower middle level uplands i.e. the U1(145u) series described as soils developed on intermediate igneous rocks (andesites) which are well drained, very deep, dusky red friable clay (nitro-Rhodic FERRASOLS). They do not have any serious limitations to irrigated agriculture i.e. they are not shallow, sodic saline and do not get waterlogged. The soil fertility is describes as low but is subject to local differences (Meru District Environmental Assessment Report, 1985). The soils description is confirmed by the Augerrings done during the survey which indicates the soils as being brown reddish up to 0.8 metres depth.

The topography within the scheme area is generally flat with slopes not exceeding 5%. The farms within the scheme have not been demarcated, however each farmer has settled on a six acre plot.

The farmers are currently practising subsistence type of farming and are growing millet, sorghum, green grams, Soya beans, pigeon peas, Katumani maize, beans and dwarf sunflower among others. Apart from growing these subsistence crops, the farmers also rear indigenous cattle and goats as well as doing uncontrolled poultry farming. The level of farming is low with no additional inputs apart from crop residue.

The area is served by a rough earthen road from Mitunguu which is impassable during the rainy season. At a section near the scheme, there is a seasonal stream which does not have a bridge across it hence impassable during the rainy season. A shorter road to Mitunguu to the scheme is not utilised because it lacks the bridge across the Thingitu River to connect it to the scheme area. The nearest market to the scheme is at Mitunguu Shopping Centre which is about 20 Kms away. The nearest tarmacked road is at Nkubu, 37 Kms away.

Description of the project

The scheme was started in 1982 by the local community. The project did not pick up then until 1986 when it was given a boost by the Embu-Meru-Isiolo Arid and Semi Arid Land (EMI-ASAL) Project. The project's original aim was to provide irrigation water for growing food crops at self sustenance level. The EMI-ASAL surveyed about one-quarter of the scheme area in 1991 and a design document was then prepared by the Eastern Provincial Irrigation Unit (PIU). The implementation of the scheme still did not take place because of lack of funds. In February 1993, the project was listed under the Food Scheme Policy. It therefore allowed the community to make a contribution of only Ksh. 500 thus paving the way for the project to start meaningful irrigation. The Government started assisting the project in 1989. In the year 2000, the project benefited with assistance from the Catholic Relief Services (CRS). In the year 2002, the project joined the direct assistance of the Arid Lands Management Programme.

Currently, the scheme serves 168 farm families. To facilitate smooth operationalization of the scheme, the farmers have been arranged into 15 groups. The scheme has been resurveyed by Wapimaji Surveyors to cater for all members.

Project Technical Design

The original technical proposal was for the implementation of an open furrow irrigation system where earthen canals were used for flow conveyance. The flow is by the force of gravity because of the favourable topography. It was also intended that the first canal section be lined from the intake to drainage 489 because of loose sandy soil conditions, its proximity to the river and the rugged terrain near the intake. The members were to be assisted to secure a contractor to construct the weir, line the proposed canal route, and construct the division boxes, drop structures and road crossings. The members were in turn expected to provide all the unskilled labour such as;

- Breaking of hard rocks to obtain ballast for making concrete
- excavation of canals
- Bush clearing when setting out the works among others.

The intake works involved the construction of a weir across River Thingitu. The initially established intake location lacked a hard rock for proper intake keying. A new intake with firm rock was thus identified upstream of the initial one. A site survey was done to connect it to the initially established one. The weir crest level was set at a level slightly higher than the normal water level at the intake site. The following specifications were made for the scheme:

- River bed level at intake site- 994.450m
- High ground level along the route-998.16m
- Normal water level at intake site -995.490m
- Weir crest level-996.000m
- Raised water level at intake-996.005m

The flood water level based on the 1995 floods was established at 998.27m. An abutment wall to guide the water over the weir during normal flows was constructed along the embankments. They have been raised to a height of 0.5m from the weir crest level. The right river bank in the direction of the river flow which got lower ground levels was to be protected using grouted rip-rap with a thickness of 150mm so as to reduce erosion during flood period.

The construction works involved the following activities in a nutshell:

- Construction of a spillway to carry diverted river flow during the construction of the intake
- Placement of a coffer dam to assist in the flow diversion
- Construction of the weir across the river 8m in length, with a height of 1.55m, bottom width and a top width of 1.0m combined with an intake chamber
- Provision and laying of rip-rap one side of the river banks to reduce erosion which could lead to weakening of the weir during flood flow
- Piping a section of the main line for a length of 85m using a 400mm diameter pipe
- Excavation of hard rock on the river bed embankments
- Lining of a section of the canal for a length of 400m, a width of 0.8m, a height of 0.71m and a thickness of 0.15m with a flow regulator incorporated from the intake
- Placement of gabion mattresses upstream and downstream of the weir and on one side of the river.

(Most of the above provisions of the technical proposal were not adhered to hence some of the biophysical impacts of the scheme)

The scheme design was to cater for only 160 members irrigating during day time (12 hours) and each irrigating 1 acre (0.4 Ha). The scheme is divided into 15 groups varying between 12 and 18 farmers to allow a recommended unit flow of 10 to 20 L/s. The division boxes are constructed at all the group heads to divide the water proportionally to the groups from the main line. The flow to the group farms is continuous where as the group flow will be rotated among members for the hours designed for in that group. Due to the variation in the number of members in the groups, the irrigation duration has been chosen so as to give a maximum irrigation interval of 7 days and allow for at least one rest day per week. Based on this arrangement, the group flows are calculated separately and summed up to get the scheme flow.

The original technical design envisaged an operating efficiency of 50% owing to the nature of the scheme (open furrow system in an arid area). However, due to the excessive lengths of the main and the secondary canals from the head of the scheme, to the last division/distribution box, a seepage loss of 2.5L/s per Km was further anticipated by the technical design in the canal sections based on their lengths. The flows to the individual members is very little thus increasing the losses resulting in even lower irrigation efficiencies.

The project is administered and managed by the community through an elected committee which serves for a period of one year.

Negative environmental impacts

- **Water Volume:** Water abstraction in this project is not metered at present. This means that the exact volumes of water used for irrigation is not known.
- **Water Loss:** The irrigation water is lost due to the open canal system used. This is exacerbated by the high temperatures in the area responsible for high evaporation rates and sharing of the water during the day.
- **High water seepage:** The seepage is high due to the nature of the canal which lacks concrete or piped surface to educe underground water seepage. This has contributed to the flooding of the local access roads
- **Canal Siltation:** An ineffective soil conservation measure in the area has caused siltation of the canals hence reducing water flow rate and quantity.
- **Malaria Spread:** It is alleged that there has been slight increase of malaria cases due to the open canals passing homesteads (pers. Comm.). However this cannot be supported due to lack of data and we cannot relate increase in malaria to the pans
- **River Bank Erosion:** The existing weir has caused the water to erode the river banks on the upper section of the resulting dam.

Positive environmental impacts

- **Increased Food Security:** The number of households already irrigating the plots is 160 each with one acre farm. One community member implied that the project has enhanced food security
- **Local Income Growth:** The project has boosted local incomes due sales of local farm produce (pers. Comm.)
- **Water Accessibility:** Water for domestic use has been brought closer to the community owing to this canal.
- The project has enabled growing of bananas, mangoes, oranges and variety of vegetables

Existing Mitigation Measures in place

- Desilting of the open canals is undertaken regularly by the local community
- Lining of the open canal is being undertaken to reduce loss of water through seepage. This is already being done but only 160ms has been done out a planned 1Km.
- Water intake is closed during the rainy season to avoid wastage when there is excess flow of water from the rains.

Recommendations for the new EMP

- Complete the lining of the planned section of the open canal
- Install a master metre at the intake to measure the amount of water being abstracted
- Share the water from 4pm to 8pm and from 5am to 9 am to reduce the amounts lost through evaporation
- Grow soil holding crops close to the furrows e.g. Napier grass and sugar cane to cut down on siltation
- Control of waterborne diseases through either awareness creation,

Environmental screening for the project was not undertaken due to the fact that the project had already begun way before ALRMP provided the support. However an EMP was put in place to address potential impacts

3.1.2 Kiambindu Micro-Irrigation Scheme

Project Background

The Kiambindu Scheme is situated in Evurori division, Ishiara location Evurori sub location covering Kagadari A and B villages. Kiambindu is situated about 40 Kms from Siakago Town (the district headquarters of Mbeere District). It is also located only 2.5 Kms from Ishiara market centre.

The farms within the scheme have been demarcated; farmers operate on free hold titles. The small scale farmers grow mainly subsistence crops and horticulture to a small extent. They keep zebu cattle, sheep and goats and practise uncontrolled poultry keeping.

Description of the project

The project is a community initiative that has got funding from collaborative efforts of Arid Lands Resources Management Project II-Mbeere and Eastern Province Horticulture And Traditional Food Crops Project-IFAD aimed at addressing livelihood vulnerability to drought and promotion of traditional crops in the perennially drought prone community. It is registered as self help group by the Ministry of Home Affairs and National Heritage (Certificate no. 1654) under the name Kiambindu Bidii Self Help Group to achieve the following goals:

- Increase food security to all households in the project area
- Provide other income generating activities (presently, the Kagandari community have no cash crops)
- To create employment for 15 people per acre permanently
- To mitigate drought conditions through horticultural enterprises
- Provide water for irrigation
- Soil and water conservation and
- Environmental conservation
- Poverty alleviation
- Creation of self employment

The group initially consisted of 41 members but currently has 60 members due a high demand for irrigation water. The scheme draws water from River Thuci. The river forms the boundary between Mbeere and Meru South districts particularly at the abstraction site.



Plate 1. Kiambindu irrigation project

History of the project

During the 1994 drought, the group used to block the intake using sand filled sacks and divert part of the river to a canal they had dug. Irrigation was done by use of hand watering cans. This was insufficient for any meaningful drought mitigation. In 2004, ALRMP II started a partnership with the community and the Ministry of Agriculture to provide mainline and laterals so that the group would have the livelihood vulnerability to drought greatly reduced. The scheme started with only 10 members.

Project Technical Design

According to the abstraction permit (REF.NO.WD/AP29191) issued to the project on 17th June 2004, the Water Apportionment Board allowed the withdrawal of 564.40 Cubic metres per day from flood flow from drainage area 4EB for general irrigation of 25 Ha. The permit further allowed for tapping of the water by diversion facilitated by a weir 1.5m high and a gravity pipeline.

The project was implemented by three different stakeholders in three phases as follows:

- | | |
|------------|---|
| PHASE I: | The intake was constructed by the community with the assistance of IFAD-EPHTPC project |
| PHASE II: | The mainline of about 3Km was done by the community with the assistance of the Drought Management Office. Lateral pipes of three inch have been bought and are about to be laid (The audit team physically inspected the pipes) and |
| PHASE III: | Survey for the third and final phase is now being done by JICA and the Ministry of Water and Irrigation (GoK) |

As at the time of this environmental audit, the above phases had accomplished the following activities:

- Construction of a weir and intake chamber
- Excavation of the main line
- Laying 2km of the main line
- Laying of lateral line for Block one (group of farm families)
- Establishment of a group farm
- Start of crop production in both group and individual farms
- Constitution of a democratically run community project committee
- Holding of training sessions for the farmers

- Establishment of a tree nursery to foster agro-forestry in the project

The project is administered and managed by the community through an elected committee which serves for a period of one year.

Negative Environmental Impacts

- Water abstraction is not metered Low flow downstream during dry season upstream
- Loss of water through evaporation as irrigation is undertaken when evaporation rates are high
- Loss of canal water through ground seepage

Positive Environmental impacts

- The project has put an additional 10 households on irrigation system and more (160) are earmarked. This will improve food security and incomes in the area.
- For the group member's water has been brought to their doorsteps. Easy access of water by the households in the area.
- The project has led to young men who had left the area in search of jobs in urban areas like Nyeri to go back to farm

Existing Mitigation Measures in place

- Soil conservation measures in place through stone piling and terracing
- Promotion and growing of indigenous tree species
- Group members are being trained on environmental management
- The group has established a field farmers training school on the group plot
- Establishment of tree nursery to provide tree seedlings for soil and water conservation

Environmental screening for Kiambindu project was undertaken and an EMP developed

Recommendations for the new EMP

- Increase the spillway to reduce water retention period thus preventing river damming
- Reduce abstraction during low water levels /dry period to equally share the water upstream and downstream
- Install a master meter to monitor amounts of water abstracted

3.1.3 Alango Arba Incinerator Project

Project Background

The Alango Incineration project is located in Alango Arba location of Daadab Division. The area borders Dertu to the north, Abakaile to the north east, Shimpirey to the west, Garissa town to the south west and Korakora to the south and Ebla Adey of Fafi to the east.

Land has not been adjudicated and hence the holding is communal. The area is arid and supports extensive pastoralist. The area is linked by an earth road which is constantly gravelled. The project is on Garissa-Daadab road.

Description of the project

The project arose as a result of implementation of the main project of construction of Alango Arba health post. After the health post was constructed, the problem of disposal of medical waste was identified as a potential environmental risk. The health post was put up in October 2004 with the assistance of Arid Lands Resource Management Project. The incinerator itself was subsequently put up in April 2005.



Plate 2. The incinerator at Alango

The incinerator is put up using a simple community design with no allowance for ventilation. The health post is run by the community. They have employed one community nurse. The post is administered by a Community Development Committee.

Negative environmental impacts

Potential impacts of the project that are not mitigated include,

- The medical waste is not completely burnt due to very low temperatures applied by the incinerator. This leads to accumulation of partly burnt health care waste residues which is disposed thereafter through burying.
- There is risk of soil contamination due to burying of the residue.
- Personnel handling the waste lack personal protective clothing
- The personnel also lacks training on handling of healthcare wastes

Positive environmental impacts

- Proper disposal of health care waste including sharps; which may injure children or animals if left lying around
- Control of healthcare waste scavenging

Existing Mitigation Measures in place

To mitigate potential impacts of the project, the community as well as the personnel ensures the following;

- Making sure the door is closed to avoid children from playing with the wastes as it may harm them
- Planting trees around the incinerator although they are not doing well
- Digging pits to bury biodegradable materials
- Provision of a water harvesting tank

Recommendations for the new EMP

The incinerator needs to be redesigned to improve its efficiency in burning health care waste to ashes.

1. An additional chamber should be included in the design to reduce the waste to ashes.
2. A pit should also be dug for burying the ashes from the incinerator.

The cost of including an additional chamber and redesigning the incinerator can be shared between ALRMP and the community.

3.1.4 Kikuyian Borehole

Project Background

Kikuyian borehole is located in Keekonyokie location, Mau Division of Narok District. It was drilled in the year 2000 by World Bank in conjunction with Ministry of Water Resources Development as a response to severe drought under the Drought Recovery Project. However, after the drilling and subsequent testing of its yield for two days it was abandoned, perhaps in anticipation for Ministry of Water to complete it. The borehole is 110m with adequate lining (cased) and thus not susceptible to contamination. Its yield is 1.8m³/hour. The yield was however done in 2000 and thus its correct yield is not known following the long duration after its drilling.

During the initial phase of the borehole (year 2000) the local community was not involved and thus they did not participate in the process of the project neither were they trained on water management. Subsequently the project stalled and it was abandoned and the community was not sure what to do given that they did not perceive the project as their own.

The borehole was rehabilitated this financial year 2005/2006 by Arid Lands Resource Management Project II under the Natural Resources and Drought Management Component. The community was involved in the rehabilitation process. They came under one group called the Umbrella Water Project that brought together CBOs, youth groups, women groups, the church and the primary school together with the residents of Kikuyian.

Project Site

The concerted efforts of the local community and civil society with the help of ALRMP have been able to:

- Buy the half-acre land where the borehole is located
- Fence the borehole site with a barbed wire all round
- Build a permanent generator room for the pumping of the borehole water
- Construct and install a 10,000 litre capacity heavy plastic elevated water tank
- Dig and build a pit latrine constructed of iron sheets
- Build a watchman house together with a store constructed of iron sheets

ALRMP II has purchased a pump at Ksh. 300,000.00 and a generator at Ksh 650,000.00 The borehole has not started operations as yet. However, it is expected to start by August since a generator has been purchased and awaiting due installation.

Project Surrounding

The project is located near a water collection ground (natural water pan) which collects rain water into a pool during the rainy season and perhaps the lowest point within the area and thus making the water table in this area to be high. It is below a hill that was not cultivated on the side and that slopes towards the borehole. There is a school nearby, about 1km, which is also adjacent to a local community church. The closest human settlement to the borehole site is about 1km which is interspersed by a local market centre. The raised upper side of the borehole remains uncultivated and had shrubs and a few trees. The hill is not cultivated and thus there is no likelihood of erosion from uphill or contamination by fertilizers and pesticides. A pit latrine has been constructed in the project site to be used by the communities while drawing water from the pump.

The dominant land use is wheat farming, maize intercropped with beans, livestock keeping and settlement. The land tenure is on freehold, subdivided and allocated to individuals.

There are future plans to supply the water to the schools and market center around by flow of gravity after installing pipes for distribution.

Negative Environmental Impacts

- **Underground water contamination from pit latrine:** The pit latrine is sited on the higher ground and at the same gradient with the borehole. This may lead to potential contamination of the borehole water from human waste emanating from the pit latrine and could lead to the outbreak of diseases like typhoid and diarrhoea among others. The pit latrine therefore needs to be closed down and relocated to the same gradient with the store and watchman house or to another place far off from the borehole.
- **Water Point Conflicts:** At the time of the audit there were no plans for separate watering points for livestock and people. There is need, therefore, for separate points for people, cattle, and sheep and goats in order to avoid conflicts and water contamination including soil erosion from trampling by livestock.
- **Inadequate Spillway:** The spillway for the watering pipe within the site is inadequate and needs to be expanded, raised and drained off because it currently causes pools of water around the area and could be a potential breeding site for mosquitoes and other water borne diseases.
- **Waste Oil Contamination:** There is no plan to manage oil waste that will emanate from the generator set which will be diesel propelled. This can become a potential impact especially if poorly disposed as it could lead to contamination and pollution.
- **Water Testing:** The borehole water has not been tested for normal water testing required including BOD, COD, Arsenic, heavy metals etc. This is because the borehole is not yet in use. Lack of testing of the water before consumption could lead to fatal human and livestock impacts including poisoning or sickness.

Positive Impacts

The Kikuyian borehole is anticipated to serve between 40 to 110 families (with each household members composed of in average 7 persons) and over 3,000 cattle, together with primary schools and churches.

Existing Mitigation Measures in Place

- The area has been fenced with barbed wire all round
- A pit latrine has been constructed using iron sheets
- A watchman house together with a store constructed

Screening Form is duly filled and recommendations to mitigate impacts identified made as required when filling the screening checklist for community micro-projects. The mitigation and course of actions recommended are plausible and feasible enough to arrest the adverse impacts appropriately.

Recommendations for the new EMP

1. Live fencing should be started since the barbed wire will not be sustainable in the long run. Planting of trees within the borehole site and the upper part needs to be undertaken as it would also contribute to natural beautification of the project site.
2. Borehole yield should be re-tested to establish whether it is still 1.8m³/hr or less and possibility of enhancing it.
3. Testing of the borehole water for water quality especially total dissolved solids, BOD, COD, ions and heavy metals should be undertaken before the borehole is given to the community for use

4. Training of committee on water and sanitation, management and conflict resolution
5. There is need to seek alternative points upon which water will be distributed to reduce environmental impacts.
6. There is no reported case of water conflict so far since the borehole is not yet operational. However, in case of such conflicts, the existing management structure by the community (CBOs, community elders, church leaders, and school representatives) has been instituted to be able to resolve such conflicts
7. EIA should be done for proposed water storage tanks, distribution and watering points and an EMP developed.
8. An EMP for oil management should be developed before the borehole is handed over to the community.
9. Erosion will prevail if alternative site for watering of animals will not be found due to over concentration of animals and people in small half-acre plot.

3.1.5 Olchorro Letuya Ole Tunya Spring

Project Background

This spring is called Panai Oletunya, which is derived from the family name of Ole Tunya that has inhabited the area since 19th century. The project is located in Ntulele location, Mau division. It is located in a semi arid environment that water scarcity is prevalent and watering points is over considerable distances. This spring has been a source of water for over many generations of Ole Tunya family that settled permanently on the side due the permanency of the water spring. Earlier on before 1986, there existed a small dam and cattle trough constructed of logs and plastered with mud. This was inadequate for the large number of livestock, animals, and people that came over great distances during dry season. In 1986, a dam was constructed of concrete together with a livestock trough. However, elephants, buffalos and livestock often broke the fence and trampled on the source of water-the spring eye, especially during dry season making the dam water no longer clean and safe for animal and human consumption.

In June 2006 through the DMO intervention the spring was protected and animal-watering troughs constructed about 50ms downstream and a separate water tap for communities constructed in order to separate the watering points for animals and human beings. The spring is permanent and during the dry spells animals and people come for water at this point, serving a radius of 40 kms with the number of people and livestock per day during peak periods (dry season) ranging at about 1500 and 3,000 respectively.

The spring was located in a 50 acre forest that was demarcated and designated by the community. The forest is still intact with no encroachment. The forest has some wildlife such as buffalos, antelopes, birds, etc. Outlying the forest are farmlands of wheat and maize as well as livestock grazing fields.

There are no reported conflicts over water use despite the large number of animals, livestock and people using the spring during the dry season. During the dry period a member of the spring committee is often there to direct and keep order. This is done voluntarily through established community management mechanisms. The community is homogenous (Maasai) with strong customs and tradition. The elders still have a strong influence in community affairs and regulate water and other natural resource use, access and management. Wild animals often come during the night and thus no human-wildlife-livestock conflict reported so far.

Negative Environmental Impacts

- Construction of the dam has led to concentration of leeches in the water that often harm livestock.
- There has developed soil erosion on the path that lead to the spring.
- Animals stepping on water trough because it is very low leading to contamination

Positive Environmental Impacts

- There is potable water supply throughout the year, which will reduce incidences of diseases and animal deaths that often is prevalent in semi arid lands due to the drought.
- The spring has led to separation of water points for animals and people and thus eliminates possible conflicts between people and livestock/animals.

Existing Mitigation Measures in Place

- It is well protected with inlets for livestock and people separated
- The troughs are made of concrete with adequate spillways that allows for the excess flow of water back into the natural river.
- Animals watering points (holding) for water is adequate for large number of animals
- Community watering point spills directly into the river in case of excess flow
- The spring catchment is composed of 50 acres of indigenous forest that is not encroached upon. The community guards it and allows for medicinal harvesting only.
- The existing dam is 2/3 full and infested with leeches
- Animal trough has a spill way into the river.

Screening Form is duly filled and recommendations to mitigate impacts identified made as required when filling the screening checklist for community micro-projects. The mitigation and course of actions recommended are plausible and feasible enough to arrest the adverse impacts appropriately.

Recommendations for the new EMP

To improve the benefit of the project and mitigate adverse impacts, the following needs to be undertaken

1. Testing of water for its quality in approved labs i.e. metals, ions, TDS, BOD, COD, etc. should be done and a monitoring system established.
2. De-silting of the dam as well as raising it a bit higher to increase to increase water capacity should be done.
3. Catfish should be introduced to feed on the leeches which is a major problem to livestock and poses danger to human beings.
4. Supply pipes to water the troughs should be buried
5. Fencing of the spring and dam site should be done immediately
6. The area surrounding the trough (earlier and current) should be dug to about 1 ft and stones/gravel poured into it to prevent erosion and wearing off of the sides of the troughs as a result of livestock trampling on it.
7. An additional trough, which is raised adequately, should be constructed for the cattle and leave the current one for sheep and goats.
8. Trees should be planted around the spring. The trees should be water friendly and adaptable to the site.
9. Soil (raised) around water troughs both the old one and current needs to levelled off
10. More gravel needs to be put on top of the spring point and not soil as is presently

3.1.6 Chepareria Livestock Sale Yard

Project Background

The sale yard is located in Chepareria Town Council of West Pokot District. The land was bought by the Town Council. The location is strategically located such that it is the major livestock outlet in West Pokot due to its accessibility and catchment to the expansive semi arid area which is a livestock zone. Earlier before construction of the sale yard, livestock was being sold along the nearby river banks, which often led to contamination of water that was being used also down stream. This was as well causing river bank erosion due to excess trampling. Accumulation of livestock waste every day in town was also a major

problem as well as the problem of livestock roaming without order posing great danger to children and women.

Before establishment of the current sale yard, livestock were being sold along the nearby riverbank. This not only posed serious environmental degradation of water course and river banks that was being used as a source of drinking water downstream, but also it was difficult to collect livestock cess and loading of livestock to vehicles. Cattle for sale used to roam everywhere in the town council depositing cow dung on streets and pavements. This precipitated the council to buy land and the ARLMP provided resources for the construction of a sale yard. The sale yard has been handed over to the town council for management.

The Town Council is small with a few buildings. It is located below Kamatira forest, which is on a rugged mountainous area. Farming is scanty and livestock keeping is the major socio-economic activity.

Negative Environmental Impacts

- The sale yard is gently sloping with only a small part holding water when it rains. This can cause water contamination for sources of water.

Positive Impacts

- The project has prevented degradation of nearby riverbank. This not only posed serious environmental degradation of water course and river banks that was being used as a source of drinking water downstream.
- Before the project cattle for sale used to roam everywhere in the town council depositing cow dung on streets and pavements.

Existing Mitigation Measures in Place

- The yard has been partitioned into many (over 10) pens. Each animal type i.e. cows, sheep, goats and chicken have their own pens. This will not only bring order in the market but also easy management of the site
- There is also a cattle auction pen for cattle. The auction yard and street leading to loading ramp is metal gridded.
- Loading ramp is constructed of concrete and so is the auction yard. The stand for cattle buyers is conveniently raised and roofed with iron sheets. The auctioneer is opposite the buyers stand and it is also roofed and the floor cemented.
- The pit latrines (four compartments) are located just outside the fenced area and are well kept well kept and clean.
- Fenced all around with wire mesh and fairly strong cedar posts. The cedar posts withstand the termite menace and therefore last for many years.

Screening Form duly filled as communicated to the consultant by the DSG but records to show evidence cannot be trace.

Recommendations

1. Drain off the sites that water stagnates
2. Future sale yards should be all fenced with metal bars and not posts and wire mesh, as this would easily be vandalized. This can also be done on this sale yard.
3. Street leading to loading room that is composed of auction yard needs to be constructed of concrete
4. Water provision to the site needs to be done immediately
5. Planting of trees around (outside the fenced yard) needs to be undertaken and protected.

3.1.7 Kases Earth Dam

Project Background

The earth dam is located about 140kms from Kapenguria town and is situated about 50kms from a permanent river on Kenyan site and considerable distance from the water points in Uganda side.

Permanent water source is about 50km towards Kapenguria town. Therefore there was no water over a wide range of land. Water points in Uganda often result in conflict whereby clashes with Karamojong often ensue with loss of cattle and human life. This location was the best possible site option identified by the Pokot community and EIA team after assessment of the two sites.

The earth dam (water pan) was 1 month old since its construction and already there was water inside it. The water pan has a capacity of 17000m³

Negative Impacts

- There is a maize cultivation just 5m from the dam on the catchment part that could result in erosion.
- The community being pastoralists there are signs of vegetation degradation around the dam. Apparently there area had Acacia trees prior to the dam

Screening Form duly filled as communicated to the consultant by the DSG but records to show evidence cannot be trace. EIA study undertaken on this project but the EIA document cannot be traced for verification purposes.

Positive Impacts

- Before the earth dam was put up there was water conflict whereby clashes with Karamojong often ensue with loss of cattle and human life.
- The dam is now a source of water for the community

Existing Mitigation Measures in Place

- The dam has two siltation traps and two cut off drains to collect and divert water to the dam.
- It is designed such that the excess water has an outlet to prevent overflow on the dam-raised part.
- The soil is still loose and not compacted leading to erosion
- It is close to the road

Recommendations for the EMP

1. Fencing of the dam should be done as soon as possible to prevent people and animals climbing on the loose soil, which can lead to accidents and thus loss of life
2. Cultivation should be prohibited on the catchment area especially cut off drains that direct water to the dam. The current maize plantation/farms on the site should not be allowed.
3. Planting of shrubs should be done as soon as possible to assist in holding of soil and prevent erosion of dam raised sides. This is because planting of grass will entice the livestock to the area which will climb and cause more erosion. This sisal family has deep roots and animals do not feed on them.
4. Cactus can also be grown around it as a live fence
5. Reinforce more soil on the dam sides
6. Desiltation plans needs to be developed as well as for the silt two traps
7. Formation of water pan committee needs to be done before the project is handed over to the community
8. Training/sensitization of the committee should be done before handing over

3.1.8 Kasina Earth Dam

Project Description

The project started during the colonial times. Water is drawn out by a pipe and tapped at a distance to avoid contamination. The dam serves Itoloni and Migwani areas. A total of 4,126 people benefit from this project. De-silting of the dam is usually done mechanically through open tenders. The silt is used for embankment. The people in this area have title deeds for their land and it therefore has to be bought in order to put it up.

Project Area Description

Mwingi district is one of thirteen districts in Eastern Province. It borders Kitui District to the south, Machakos District to the west, Mbeere and Meru south District to the north and Tana River District to the east. The district lies between latitude 0° 03' and 1° 12' south and longitudes 37° 47' and 38° 57' east of GMT. The district covers an area of 10,030.30km².

Administratively the district is divided into nine divisions which are central, Migwani, Kyuso, Mumoni, Nguni, Ngomeni, Nu, Mui and Tseikuru.

Mwingi District is generally plain with a few inselbergs in Mumoni, Nu and Migwani divisions. The highest point of the district is Mumoni hills, with an altitude of 1,747m above sea level. The landscape is generally flat, with a plain that gently rolls down towards the east and northeast where altitude are as low as 400m.

Topography of the district affects communication within the district and other districts. This is especially for the case in southern and northern parts of the district where Nu, Mui and Mumoni are not easily accessible because of the hills.

The highlands namely Mumoni, Migwani, central and Mui divisions receive more rainfall compared to the lowlands Nguni, Kyuso and Tseikuru divisions. The drier areas experience severe droughts, which have led to livestock death and food shortages.

The district has red sandy soils, loamy sand soils and patches of black cotton soils. River valleys have saline alluvial soils of moderate to sometimes high fertility. Otherwise, soils are of low fertility and prone to erosion. Most hills are covered by shallow and stony soils unsuitable for crop farming.

Climate of the district is hot and dry for the greater part of the year. The maximum mean annual temperature ranges between 24°C and 26°C. The maximum mean annual temperatures in the district vary between 14°C and 22°C. Average annual temperature is 24°C. The district has two rainy seasons, i.e. March, May (long rains) and October- December (short rains). Rainfall ranges between 400mm and 800mm per year, but is erratic. The short rains are more reliable than the long rains in the district making the district peculiar to the rest of the country.

In Migwani, Central and Mui divisions, crop farming is more prominent than livestock keeping because of higher amounts of rainfall received.

Currently, the district has two agro-ecological zones i.e.

- I. Mixed farming zone
- II. Agro-pastoral zone in which most if the project id based on

Mwingi district is a homogenous district inhabited mainly by the Kambas. The district has a current population of 341,571 based on 1999 population census and is projected to rise to 377,081 people in 2008 with a growth rate of 2.4%. It has an average population density of 30 persons per km². More than 95% of this is rural based while 5% is the urban population of which, Mwingi town has 4% while the rest is distributed in other trading centres. Migwani is the most densely populated division (101 persons per km²),

followed by Central, Kyuso, Mui, Nu, Mumoni, Tseikuru, Nguni and finally Ngomeni being the least populated (7 persons per km²).

Central division registered the highest population, which stood at 83,687 in 1999 and is projected to increase to 103,864 by the year 2008. The high population can be attributed to the urban status where Mwingi town is situated, as well as higher potential for agriculture. Central division has a population density of 69 persons per km² and is projected to increase to 86% km² by the end of 2008.

Ngomeni division had the least population of 10,712 and are projected to increase to 13,294 by the year 2008. The low population can be attributed to low and unreliable rainfall for cultivation. Ngomeni division is predominantly a livestock zone with a population density of 7 persons per km².

The district shows a very high prevalence of poverty, which is estimated at 60% with the poor residing in the driest division of the district namely Tseikuru, Kyuso, Ngomeni, Nguni and Nu divisions. Migwani, Central and Mui have the least poverty prevalence.

This to some extent has been contributed to by cattle rustling over time in which some cases farmers along the Tana River district border have lost their whole herds severely to the pastoralists from Somali origin. Many lives have also been lost through this rustling but the frequency is reducing now.

Negative Environmental Impacts

- Pollution from the communities dwelling upstream
- Silting of the dam due to agricultural activities around it
- Iron and coliforms present in the water 2.99mg/l and 7 mg/l above the standard maximum limits respectively

Positive Environmental Impacts

- Reduction of distances travelled to look for water
- Downstream seepage helps to water crops in the downstream areas

Existing Mitigation Measures

- De-silting of the dam regularly
- Lowering of the spillway to reduce loss of water when it rains
- Fencing to avoid pollution and contamination

Recommendations for the EMP

1. Prevention of silting through terracing to lower the flow of water
2. Creating awareness to the community on the upstream situation and pollution
3. Provision of controlled entry points to the dam

3.1.9 Gababa Water Pan

Project Description

The water pan was put up in the year 2005 to serve the people in Masalani location due to poor rainfall. The land tenure system in this area is purely trust land. The water pan can hold a volume of water of 15000m³. Construction of the pan was mainly done by the members of the community so as to give them a sense of ownership. The excavated soil from the construction of the water pan is used for its embankment. However, the government authorities face various challenges as the community's level of awareness is low and they need capacity building.

Project Area Description



Plate 3. Gababa water pan

Negative Environmental Impacts

- There is high prevalence of water borne diseases such as bilharzia, diarrhoea and cholera
- Silting of the water pan due to erosion of the bank and incoming dust
- Population influx in the area due to the presence of a water source
- Building of more settlements which affect the nomadic way of life thus increasing degradation

Positive Environmental Impacts

- The distances travelled to look for water have been reduced by half to those near the project site
- Sanitation has improved especially in Gababa primary school

Screening for the project was undertaken and an Environmental Management Plan (EMP) developed for mitigating and managing the pan. However from the review of the checklist for the project, its apparent that the individual checking the potential impacts of the project lacked the technical know how of identifying impacts

Existing Mitigation Measures

- Planting of trees around the water pan although they are not doing well
- Fencing of the water pan to avoid misuse of water and any other form of contamination from animals and man

Recommendations for the EMP

1. Providing one entrance to the water pan to avoid contamination
2. Distribute water sources to spread the human population thus reducing pressure on the environment
3. Promote hygiene education and awareness as well as water treatment

3.1.10 Thirigitu Mt. Kenya Women Group

Project Description

Thirigitu- Mt. Kenya Women Group project is located in the fringes of Thigo Forest, in Kieni East Division of Nyeri District. The project was started by women who grouped together to establish tree nurseries with two main objectives; first, to replace the tree cover in the deforested Thigo Forest, and secondly, to provide household income through the sale of tree seedlings to the local institutions and individuals.

The women group is raising trees in nurseries. Both indigenous and exotic tree species are being raised. These include; *Markhamia lutea*, *Grevillea robusta*, *Cordia africana* (*Muringa*), *Prunus africanus*, *Casuarina equisetifolia*, *Podocarpus*, *Eucalyptus*, *Whistling pine* and *Cyprus*.

The community applied for the land from the forest department and it was eventually granted to them. The project uses stream water from a constructed furrow to provide water for domestic use. The water flows by gravity along this furrow towards the project site and a pipe siphoning water from the furrow is therefore used to water the nursery beds.

Project Area Description

Thigo Forest is preferred by elephants as their breeding ground because of its richness in salts. The forest is made up of natural tree species comprised of *Podocarpus falcatus* among others. The vegetation in the area is scenic and floristic with various tussock grasses. An imposing extinct volcano dominates the landscape of the project area. A river (Nairobi River) flows on the lower end of the project site. The soils for the project are fertile enough for raising the seedlings though at times organic manure is used.

Apiculture has also been started in the project site purposely to diversify income for the women groups. There are 30 wooden beehives in an array of threes suspended on ten perches. The apiaries are on a different site adjacent to the tree nurseries. The whole project site is fenced using a wire net.



Plate 4. Furrow from upstream to the Project site

Positive Environmental Impacts

- Group income has been enhanced through the sale of tree seedlings. The office of ALRMP II has in the recent past bought trees worth half a million shillings from the Group
- The destroyed forest cover is gradually getting replaced by individual tree species.

Negative Environmental Impacts

- The black polythene papers for seedling compaction are scattered in the project area with some spreading in the adjacent River Nairobi.
- The operation of the project is within the wildlife corridor between Mt. Kenya and the Aberdare Range. This contributes to reduced corridor area and wildlife-human conflicts.
- Some of the trees have been cut in the forest to keep off elephants like the *Ricinus species*.

Existing Mitigation Measures

- Since the elephants used to be attracted to *Richmus communis* and *Leucena* species, the two were uprooted to protect other seedlings from the damages caused.

- Every member must plant 4000 seedlings for the project to boost the destroyed forest cover before he/she can get a development loan from the Group's revolving fund.
- ALRMP II has been undertaking training workshops with the communities to enhance environmental awareness and appropriate tree nursery management.



Plate 5. A section of dry river Nairobi silted due to anthropogenic activities upstream

Recommendations for EMP

1. Protect the riparian buffer strips by re-establishing streamside forests made of trees, shrubs and grass to buffer pollution of waterways from adjacent land, reduce bank erosion, protect aquatic environment and enhance wildlife value.
2. Routinely train the nursery Self Help Groups on proper seedling management and marketing in order to make the initiative fruitful and sustainable.
3. Subsequent relocation of the group's project should focus on avoiding the wildlife corridor.
4. Provide a water pan in the bees site in order to guard against possible human-bees conflict over water in the created furrow or flanking river
5. Plant conspicuous scented flowers in the apiary site.
6. Plant trees in the apiary to provide natural shade for the bees

3.1.11 Trefos-Kiburuti Water Tank

Project Description

Trefos-Kiburuti water tank is located in Kieni East. The project was started to correct the problem of water scarcity in the area. Presently water is fetched from a river which is quite far from the areas of residence. The water tank has therefore been constructed using blocks, sand and cement. After completion the project is expected to serve over 1000 families within the area. The tank capacity is 225m³. The community greatly participated in labour provision and material supply.



Plate 6. One of the open tanks still under construction

Project Area Description

The tank is sited on one acre piece of public land which was provided by the authorities after the community requested for the space. The area is under fence. The project site is characterized by short grass around, friable black cotton soils with no trees planted in the immediate surrounding.

Positive Environmental Impacts

- Convenient supply of clean water to the community is expected.
- Control of water-borne diseases through provision of clean water
- Reduced wastage of time and improvement of education standards as children don't have to miss school looking for water
- Improved standards of living reducing direct dependence on natural resources through unsustainable harvesting.

Negative Impacts

- Open channels for piping that pose a risk to human and animal safety particularly during dark hours.
- Use of timber and poles to construct tank and poor security for re-usable timber leaving the items open to theft.

Existing Mitigation Measures

- The grass is well kept in place since no much ground excavation was done.
- Tree planting exercise is in place by the CDC and individuals.
- Proper disposal of soil dug from trenches in order to retain the aesthetic value of the natural project land.
- Environmental screening was undertaken before onset of the project and monitoring by the DSG is occasionally carried out.

Recommendations for EMP

1. The main drain pipes (wash way) should channel water back to the river whenever tank cleaning is undertaken.
2. Installation of pipage should be undertaken rapidly so that open trenches can be covered.
3. Re-use of timber should be promoted. Timber that remains from the construction should be stored safely to be used in other community project.

3.1.12 Kaga Water Project

Project Description

The Kaga water project in Nyeri district is on the fringes of Mt. Kenya. The project was started to provide clean water to the residents in the area. Water to the tank is drawn from River Nanyuki around the slopes of Mt. Kenya. A pipeline covering 6.252km was laid from the intake point to the storage tank. Water is supplied along gravity lines to household users. Several financiers have played significant roles in this project for instance, IFAD, Action –Aid and ALRMP II. The community has been very significant in terms of labour provision and material contribution. Water is served from communal points. About 412 members are registered in the project but 200 individuals have been connected with water. Each member contributes a monthly fee of kshs.100 for project maintenance.

Project Area Description

The project is set up on one acre land that was provided and still belongs to the forest department. Fencing has not been done on the site though poles are in place. The project area is extremely windy. Several exposed holes and trenches are a common site within the project compound.

Gullies have formed around the tank. The containment of water in these depressions is an impending hazard which can lead to water contamination through underground seepage.



Plate 7. One of the depressions around the water tank



Plate 8. A section of a trench next to the tank

The project area is a flat land covered with vegetation and a few stands of indigenous trees with stunted growth. A holding pen has been established within the project area to contain seized livestock grazing in the

forest area. The presence of pooling water around the tank attracts the grazing cattle which have trampled the project site and they are bound to damage the water tank if serious precautions are not taken.

The openness of the area to livestock has caused overgrazing and erosion of soil in the area. There is also poor soil disposal at the project area as evidenced by heaps of loose eroded soil in the tank area. Moreover, the strong winds blowing in the area could cause more erosion and destruction of some weak structures.

Positive Environmental Impacts

- Many families have gained access to clean water for domestic use.
- Small-scale but substantial irrigation projects have taken a great course hence improvements in family income and food security. Using overhead irrigation (sprinkling), such food crops as kales, tree tomatoes, irish potatoes, pepper and a number of tree fruits have been raised.
- Pockets of cross-breed dairy cattle have been kept because water is conveniently available in desired quantity.
- Water-borne diseases have been controlled in the area since clean water is supplied to users.

Negative Environmental Impacts

- Stock piling of excavated soil has changed the landscape
- Open gullies pose a safety risk to human and animals
- Open gullies and movement of livestock coupled with the soil type encourage erosion.
- Flooding of water around the storage tank

Existing Mitigation Measures

- The neighbouring communities have undertaken tree planting initiatives to act as wind breakers.
- Flow to the water tank is controlled to avoid water overflows once the tank is full
- There is holding pen in the area to curb grazing in the forest reserve.
- Environmental screening was undertaken before onset of the project and regular monitoring is undertaken by the DSG
- Small scale sprinkling irrigation is used in irrigation as opposed to direct watering as a measure to conserve water.

Recommendations for EMP

1. Seal all the open trenches in the project area and provide lockable manhole covers for routine maintenance.
2. Landscape the project site using trees
3. Ensure high sanitation standards to minimize on localized health risks from disease vectors and physical injuries
4. Ensure mosquito proofing of tank air vents
5. Put in place a wastewater retention pond to be used during routine flushing out of water.
6. Establish a tree nursery for indigenous tree species at the tank site and plant them as woodlots.

3.1.13 Gulley Erosion Control through Construction of Check Dams and Gabions in Sololo Mlimani

Project Description

Mlimani is located at the foot of Borolle Hills, a range of hills extending from Sololo Makutano to Kar-Bururi approximately 10 kilometres. After human settlements took its toll in the area, trees were felled for residential structures and charcoal burning. Gradually the natural forest ground cover was lost, the sprigs gave way and the wildlife disappeared.

The soils found in this area consist of both the black cotton and rocky stony lava soils. The black cotton soils have alluvial accumulations that are ideal for farming. The vegetation cover varies considerably with lowlands having natural vegetation ranging from open grassland to shrubs and deciduous trees.



Plate 9. Gabions on water course from Borolle Hills

With the run off downhill, the gullies began appearing and expanded rapidly. The flood waters brought with it stone and huge volumes of sand. This attracted the builders who worsened the situation further by harvesting the sand.

Project Area Description:

The project is on private land. Eight check dams were built along the giant gully. Four gabions and drift were constructed to make the road passable. The community made their contribution willingly by providing sand, water, stones, unskilled labour and ballast. At least 50 tree seedlings were planted and the area fenced off.

Positive Environmental Impacts

- Downstream flooding has been checked
- Soil loss through erosion has been controlled.
- Prevention of gully erosion through planting of vegetation
- Safety of persons using roads that transect the gully has been ensured as well as maintenance of infrastructure

Negative Environmental Impacts

- Rills are forming on the river embankments next to the project site
- Accumulated polythene wastes are trapped in the gabions

Existing Mitigation Measures

- Terraces were dug to break the speed of water and re-direct the water away from human settlements.
- Farming and livestock grazing along the foothills were banned.
- The community planted trees to replace the lost ones and conserve the area.
- A Chief's Act was enacted to protect the area.
- Thorny braches have been put in the project site to deter sand harvesting.
- Environmental screening was undertaken before project approval and monitoring is undertaken
- Environmental screening was undertaken to ensure that the project was environmentally safe before onset. Monitoring is also regularly undertaken.

Recommendations for EMP

1. Control the rills forming on the river embankments before they build to gullies.
2. Encourage tree planting exercises both at community level and in schools.
3. Transfer the project from general community involvement to individual pursuits on private plots so that sustainability of the same is realized.

3.1.14 Walda Irrigation Project

Project Description

The project was started as a pilot for small scale food production using water from the borehole. Currently there are 68 plot sizes each managed by an individual farmer. An individual plot is 1/8th of an acre. The community development committee decides on plot allocation to individuals. The soil in the area is dark brown friable clay loam. Despite irrigation no water logging was experienced.

Crops grown include; maize, kales (*sukuma wiki*), tomatoes, bananas and pawpaw. Water for irrigation is pumped from the nearby borehole using generator. About 34m³ of water is drawn from the tank per hour. Plot partitioning is done using euphorbia. Watering is done in shifts throughout the day while others do it at night basically to give room for livestock during the day. Farmyard manure which is easily available is made use of in the farms.

Project Area Description

The project scheme is located in Walda Location, Uran Division of in Moyale District about 100 km South-West of Moyale town on Moyale Marsabit road. The project is an irrigation initiative on 4 hectares of land and supports 108 households.



Plate 10. A water tank at Walda



Plate 11. A plot of healthy crops under pipe irrigation at Walda Project area

Positive Environmental Impacts

- Household income has been boosted through production of horticultural crops that are highly demanded in the region (pers. comm.)
- Food security has been enhanced by diversifying the food dependency system in the area.
- Living standards are bound to improve hence strive towards poverty alleviation.

Negative Environmental Impacts

- Localised soil erosion especially at the tank
- Water conflicts between pastoralists and crop farmers
- Competition for forage against crop production

Existing Mitigation Measures

- Euphorbia is used to protect the farms from grazing livestock
- Project members have planted indigenous and exotic trees within the plots for microclimate improvement, soil and water conservation and as wind breaks.
- Scarecrows have been put on the plots to put off menacing birds
- Watering of the farms is usually done overnight when there are sufficient amounts for both domestic use and irrigation. However, when not sufficient it is done in the late evening.
- Borehole monitoring by the Ministry of Water and approval have been undertaken.
- Environmental screening was carried out and monitoring is done by the DSG

Recommendations for EMP

1. Mandate every plot holder to plant a specified number of recommended tree species on their farms
2. Subdivide the plots using Lucerne or Napier grass which could be used as a livestock feed instead of euphorbia.
3. Tap the water overflows in another storage tank to be used for irrigation instead of competing for water at the same time.
4. Plant fruit trees to supplement diet and income.
5. Form local farmer associations to strengthen bargaining rights prices, marketing and storage of harvested farm produce.
6. Establish tree nurseries within the site to diversify income and also improve on the micro- climate in the area.

3.1.15 Manyatta Jillo Primary School

Project Description

Two classrooms were constructed in Manyatta Jillo Primary school in Qilta-Korma location of Gadamoji Division. The two classes measure 8 by 12 feet each and were built using quarry blocks, cement and iron sheets for roofing. Over 500 pupils are currently hosted in the school.

Two storage tanks are in use for roof water catchment. Each tank has a capacity of 24 000 litres. During dry spells water is obtained from mobile tankers. The school and well wishers foot the costs.



Plate 12. The Two Classrooms constructed by ALRMP II in Manyatta Jillo

Project Area Description

The school is located within the villages of Borana communities overlooking hilly landscape around. Located about 15 kilometres from Marsabit town, the area enjoys slightly favourable weather. There are numerous trees at the school compound a number of which are exotic.



Plate 13. A section of Manyatta Jillo School Compound

Positive Environmental Impacts

- Increased school enrolment rate because of increased classes.
- increased tree stands and micro climate improvement

Negative Environmental Impacts

- Potential outbreak of diseases like diarrhoea, and other diseases associated with inadequate sanitation facilities
- Lack of installation of roof gutters in the new classrooms.

Existing Mitigation Measures

- Few tree stands were planted in the compound to control dust and also act as wind breakers.
- Roof water catchment is done during rainy seasons to provide water conveniently to the pupils.
- Environmental screening was undertaken before implementation and monitoring checklists have been field documentation was however not available at the time of audit.

Recommendations for EMP

1. Start botanical gardens within the school and incorporate fruit trees to supplement diet and income
2. Form environmental clubs and integrate community groups in tree nursery management and environmental awareness.
3. Install gutters in the new classrooms for rain catchment.
4. Link the EMCs to DEC so that there is a strong working bond and the DEC be used as the implementing agency of environmental actions.

3.1.16 Bubisa Primary School

Project Description

Two classrooms were constructed in Bubisa primary school at a cost of kshs.600, 000.00. The land area of 8 by 16 metres was used for the project. One class hosts 46 pupils while the other class accommodates 52 pupils. 40 desks were donated by the ALRMP II. The classes were built using natural stones that are widespread in the entire area. Metallic doors and windows were used because of very strong winds blowing in the area. The roof and wall lintel is sealed on the windy side while the opposite end is ventilated.



Plate 14. The two classrooms constructed by ALRMP II in Bibisa

Project Area Description

The school compound is very windy and plainly dry as shown in the picture below: Acacia trees are found along dry riverbeds and near water points. The extreme windy and near-desert conditions prevent much of plant growth.



Plate 15. A roof supported using building blocks

Positive Environmental Impacts

- Increased child enrolment in the school
- Reduced congestion in classrooms
- Use of renewable energy – solar power

Negative Environmental Impacts

- Localised impacts on the use of construction materials such as stones of which school children can stumble on.

Existing Mitigation Measures

- Roofs have been supported using building blocks to avoid removal by wind – hence danger to safety
- Metallic doors and windows have been used as a safety precaution.
- There has been attempts to plant indigenous tree species
- The school has been fenced using locally available stones to reduce movement of animals in and out of the compound.
- Environmental screening was undertaken to examine any adverse environmental impacts before commissioning.

Recommendations for EMP

Fence off the school with available materials to keep off livestock and as a wind break. There are many stones around the school and these have been used for fencing and construction. The same can be applied to create a wind break around the school.

3.1.17 Bubisa Water Project

Project Description

The community tank in Bubisa of Maikoma Division was constructed to provide water which is a very scarce commodity in the area. The bore hole was drilled over 267 metres below the ground. The site was chosen by water users association to serve Bubisa area. The water is pumped by a generator to the tank whose capacity is 80,000 litres. A few acacia trees punctuate the project area.

This tank is fed by one inlet of 2 inch metallic pipe that is pumped by a generator. Two communal bathrooms each for men and women have been constructed adjacent to the new tank. The project site is a sandy bare ground. Livestock drinking troughs have also been constructed within the site.



Plate 16. Bubisa Water Project



Plate 17. The Generator used to pump water

Negative Environmental Impacts

- Since water is drawn from a common trough using individual cans, there are risks of water contamination hence impending water borne diseases.
- There is a risk of oil spillage at the generator room and poor disposal of used oil. Used oil is normally used as a preservative for construction timber.

Existing Mitigation Measures

- Livestock drinking troughs have also been constructed within the site.
- Two communal bathrooms each for men and women have been constructed adjacent to the new tank to prevent water contamination and pollution

Recommendations for EMP

1. Ensure collection of waste oil for proper disposal and disposal of used parts such as filters by giving them back to the oil and diesel suppliers.
2. Explore use of renewable energy such as solar and wind to pump water.
3. An Environmental Management Plan should be implemented for this project.

4. Form community based water management groups to oversee any conflicts over the scarce commodity (water) in the region.
5. Control water intake during the drought period to avoid over abstraction.

3.1.18 Karungu Dam

Project Description

The project was started with an objective of providing water for livestock and domestic use. This project is located in Lamuria division, Sirima location, Ngobit area. The dam is still under construction. The project site used to be a water pan for watering livestock during colonial days and was thus set aside as a public utility after land demarcation and settlement of the indigenous people. The community therefore identified the site for development.

The project is on land area of approximately two acres. The construction materials such as gravel were obtained from the project site with labour coming from the beneficiary community.

Project Area Description

The area mainly consists of a plateau with low agricultural potential. The project area has limited vegetation stands except for few short tree stands of *Oi kinye species* forming bush-like environment. The land is bare black cotton soils that appear to be easily eroded. See the plate below.



Plate 18. Bare project area with distant vegetation

The project site borders the vast Solio ranch (vast grassland) where its inlet flows through. The dam is less likely to affect water salinity in the area because as a storage facility, it collects flood flowing from a well grassed catchment.



Plate 19. Background view of the dam's inlet catchment

The overflow outlet (as shown below) is packed with stocks to prevent soil erosion when the dam is full



Plate 20. Bare land with construction material remains at the project site

Positive Environmental Impacts

- The project will reduce the long walking distances in search for water because the precious commodity will be readily available.
- No conflicts are anticipated since it is a Community –Driven Development (CDD). In addition, there is low population density in the precincts of the project area.
- Due to availability of water, a settled way of life is anticipated in terms of food crop farming hence food security in the area.

Negative Environmental Impacts

- The immediate dam area is dilapidated owing to land clearance and unkempt construction materials
- The overflow spill way has been devegetated. The area should be vegetated in –case there is an overflow, erosion will be avoided.

Existing Mitigation Measures

- Gabions have been built along the dam's inlet to prevent siltation
- The overflow outlet is gravelled to control erosion of the project site.
- Vegetation has been maintained particularly at the inlet to mitigate against siltation.
- Environmental screening was undertaken for this project and monitoring is routinely undertaken.

Recommendations for EMP

1. Plant canopying trees around the dam area to improve the microclimate and check against high rates of evaporation from the dam. This aspect will also keep water cool for drinking and safe from foreign materials carried by wind.
2. Undertake community awareness programmes to sensitize the beneficiaries on the aspects of water conservation, protection of riparian areas and hygiene especially boiling of drinking water.
3. Control trampling of the project area by animals because of impending injuries while accumulation of biological wastes in the dam is hazardous to health and can also make water turbid.
4. Encourage individuals to fully utilize roof catchments (rain water harvesting) and water storage tanks to supply water for domestic and micro-irrigation uses like for kitchen gardening.
5. Create awareness on safe water handling and the necessity of treatment and boiling to avoid consumption of pure quality water.

3.1.19 Nkando Irrigation Project

Project Description

The project was started in the year 2000 initiated by the community to help in small-scale irrigation for food crops. The project is located in Ndaiga location, Central division of Laikipia district. The area is an agro-pastoral zone. Project funding was on a cost-sharing basis by the ALRMP II, US embassy and the community. Presently every member pays a monthly fee of kshs.50 for maintenance. Much of the labour was provided by the community.

Project Area Description

Water is sourced from River Likii which flows directly from Mt. Kenya. The river bank at the point of entry is characterised by natural tree species, short vegetation and big rock boulders. The riparian reserve forms a serene forest stretch. A sieve of small wire mesh is installed at the intake point to filter water. The main pipeline is metallic in nature.



Plate 21. Water intake point from River Likii

Water flows by gravity from the intake. It covers a distance of 3.2 km to the tank (from a height of 2400 feet to 1800 feet). About 12 litres of water is drawn per second from the river.

The water tank has a capacity of 225m³. It is made of concrete and stones that were easily obtained within the project site. The tank is on a private piece of land of about ¼ an acre. The agreement was that the Nkando project will be supplying water to the land owner.



Plate 22. The storage tank

The project area is characterized by cultivated food crops like kales, Irish potatoes, and maize among others. Napier grass and well-tendered bottle brush trees are also planted within the tank site.



Plate 23. Bottle-brush trees at the tank site

Three distribution chambers are at the tank site for supply to various users. The thickness of the main distribution pipes vary in sizes owing to the distance and number of users.

Positive Environmental Impacts

- Farmers are irrigating their subsistence and horticultural crops which has helped to attain food security in the area.
- Dairy production has improved because water is readily available.
- Schools are said to have recorded improved performances because minimal study time is lost as before in search for water.

Negative Environmental Impacts

- Water levels in the river seasonally go down owing to deforestation in the Mt. Kenya region.
- Some construction materials like broken wood and non-biodegradable plastic matter of cut pipes are lying on the site. These are hazardous to human health because of potential injuries they are bound to cause.
- Surroundings of distribution and collection chambers are depressed.

Existing Mitigation Measures

- Bottle-brush trees have been planted to reduce water evaporation
- Water overflows is channelled back to adjacent collection tank

Recommendations for EMP

1. Since water is inadequate owing to seasonal fluctuation of the river, efficient irrigation methods like drip irrigation could be used in place of the current overhead (sprinkling) method.
2. Control water intake during the drought period to avoid over abstraction which is a detriment to the riverine ecosystem downstream
3. Step up pipe surveillance mechanisms to detect and correct any leakages as timely as possible.
4. Since few farmers have taken to kitchen gardening, they should be sensitized on the benefits of the project and follow ups made.
5. The entire distribution system should be well protected with manholes, wash outs and tank covers so that the water supply and quality is not compromised.

6. Perform annual water pipe flushing on the distribution channel to remove any accumulated sediments or other impurities deposited in the pipe.
7. Environmental screening was undertaken for this project before onset and monitoring is regularly done.

3.1.20 Kilimani Primary School

Project Description

Kilimani Primary school is located West location of Isiolo District. The site of the project was chosen with community mandate. Two classrooms were constructed in the school. Each class measures 8 by 12 metres. Materials used include: Iron sheets for roofing, blocks for walls and mesh wire for windows the door is wooden. Construction timber was obtained from Meru while the others were obtained from within. The community provided labour. One of the classrooms is not under use because desks are lacking.



Plate 24. A wall slab of the two classes constructed by ALRMP II

The project is currently overseen by the Kilimani Community Development Committee (CDC). About 650 pupils are in the school with a minimal 11 teachers.

Project Area Description

The school compound is stony with a few tree stands of acacia species. About 200 trees were planted but they dried off following the prolonged drought in the region. The remaining stands were fed on by livestock. A concrete water tank of about 20,000 litres water capacity is in the school compound and it is served with water from a community borehole. This water is pumped using electricity.



Plate 25. A section of Kilimani school compound



Plate 26. A leaking water tank behind the classes

Positive Environmental Impacts

- Increased school enrolment because of additional classes

Negative Environmental Impacts

- Dust inhalation
- Inadequate toilet facilities
- Excessive stones and thorny bushes posing a danger to pupil's safety



Plate 27. One of the dust affected classes

Existing Mitigation Measures in Place

- Wire mesh has been used on windows because the heat in the area can break glasses
- Classes are watered to control excess dust
- The school compound is fenced using euphorbia with some spaces protected using thorny branches

Environmental screening undertaken to ensure that the project was environmentally acceptable

Recommendations for EMP

1. Plant more vegetation around the school to trap dust and screen against wind.
2. Enhance environmental awareness and establish a nursery for drought resistant trees in the school and plant the same in the immediate surroundings

3.1.21 Bula Mpya Primary School

Project Description

The current school is on a bare compound of black cotton soils. The classes are of wooden wall probably to insulate heat. The school has about 450 pupils under the care of 13 teachers (from pre-primary to class eight).



Plate 28. A picture of current Bula Mpya Primary School

The new school is in the process of construction by a contracted private developer. The construction cost is estimated to be kshs.1.4 million. New Bula Mpya School is on a land size of about 10.5 hectares. It is located in Isiolo Central a few metres from the old school. Trees were planted dried off during the severe drought period.

The new site was chosen in consultation with the school management committee. Four classrooms were funded by OPEC and the administration block which is on the foundation is funded by the CDC. ALRMP II has funded the construction of two classrooms each measuring 25 by 29 feet. Stones from Meru, timber, iron sheets and cement all bought from within Isiolo are used for construction. Tap water supplied from Isiolo town is used in the school.



Plate 29. The new school under construction

Relocation is expected to take place in September and this will be done in phases. Upper primary (classes four to eight) will be the first to shift.

Positive Environmental Impacts

- A better school will be provided within the walking distance
- Increased school enrolment is anticipated

Negative Environmental Impacts

- Environmental degradation caused by the project proponent in terms of widespread injurious construction materials like sharp pieces of wood
- Accumulation of rubble and several open pits within the new compound
- Wastes generated from decommissioning of the old school



Plate 30. Example of water storage pits that have been left open.

Existing Mitigation measures in place

- The project has attempted to avoid destruction of vegetation
- Collection of debris from the site

Recommendations for EMP

1. Establish tree nursery projects in the school and liaise with the community on the same.
2. The contractor should undertake tree planting in the new school as a contribution to the school
3. Seal all the open trenches in the school compound as a health and safety precaution action.
4. Environmental screening was undertaken for the project before inception.
5. Re-use materials generated from the decommissioning exercise of the old school.

3.1.22 Bula Pesa Bridge

Project Description

The project is located in Central location of Isiolo district. The project site was chosen by the community and it was constructed at the cost of kshs. 800,000. The bridge is over a seasonal river and it was commissioned in July 2005 by Bula Pesa CDC. The bridge is built using stones, metal and concrete. Narrow walkway alleys have been put on either sides of the bridge.



Plate 31. The Bula Pesa Bridge

Project Area Description

The project is an area that flanks slums of wooden shelter near the stream banks. The bridge environment is very much littered with polythene papers. Car washing takes place about 30 metres from the bridge which has made the road muddy and soggy in addition, spots of oil spills are identifiable in the place. The banks of the stream are heavily eroded forming gullies likely to change the course of water channel.

Positive Environmental Impacts:

- Ease in accessibility
- Safety of passer-by especially school children and pregnant mothers
- Reduced health problems as children are in less contact with contaminated water

Negative Environmental Impact

- Erosion on the stream banks at the bridge.
- Washing of cars near the bridge increases dilapidation of the road and subsequently of the bridge area.

Existing Mitigation Measures in place

- Stone are being used to control gulley erosion as shown on the plate below



Plate 32. Stones packed on one side of the bridge to control the gullies

Recommendations for EMP

1. Erect gabions on the upper sides of the bridge/river to curb the current erosion
2. Creation of awareness on river bank maintenance to avoid erosion and flooding
3. Attempt to move the car wash activities to a better place away from the road.
4. Build gabions upstream to direct all the water flows under the bridge
5. Environmental screening was undertaken before onset of the project.
6. Car washing should be discouraged as it contributes to river water pollution

3.1.23 Olmelil Dam Rehabilitation and Spring Protection

Project Description

The earth dam is situated in Parrar Division of Trans Mara District on a public utility plot of approximately 7 acres. The plot was designated when subdivision was done during land adjudication and registration process. The dam was constructed in 1952 by a colonialist who saw the community needed water for their animals, domestic use as well as wild animals. With poor land use practice such as cultivation on the upper catchment, coupled with cutting of trees, lack of fencing, and sound management of the dam, it led to siltation of the dam. Subsequently water scarcity ensued. The community approached ALRMP II for assistance to de-silt the dam, which they did respond through Ministry of Water Resources Development.

Project Area Description

The earth dam has been desilted and was 2/3 filled with water at the time of undertaking the environmental audit. Fencing has been done with a barbed wire and reinforced with a wire mesh and has a lockable gate. Recently planted tree are on the project site. There are a few trees where the spring eye is located and grass has started growing around the dam. This indicates that there has been no encroachment on the site.

Two bathrooms, one for female and another for the males had been put up and constructed from iron sheets with cemented floors. A generator room/house and small water treatment tank made of concrete had been constructed and roofed.

The water for livestock is from the dam while for human consumption (domestic) comes from the spring that had been tapped from the spring eye. There is a separate watering points for animals and people. Human watering point is well designed and cemented with a spillway back to the river source.

Animal water troughs are well designed and constructed with a spillway back to the river. It had a valve for draining off water inside the trough while cleaning. It is raised enough to avoid animals stepping inside the trough

The residents are farmers and livestock keepers. The catchment is cultivated with no trees or soil conservation structures on site. The land is freehold with absolute lack of titles. The communities near the dam catchment have cultivated close to the seasonal river banks leading to removal of vegetation that could have reduced siltation of the dam.

A seminar was conducted before the project was commenced. The community was sensitized through the seminar. Later a committee was formed for the water project, which is composed of 4 women and 9 men with a woman treasurer. The committee was composed of people within the dam catchment. The committee has been trained on the following:

1. Catchment area management
2. Soil and land management of the dam site and surrounding land use to prevent further siltation of the dam.
3. The need for tree planting along river banks and dam site. The species of tree suitable for the purpose were enumerated and the ones which were not suitable like blue gum that were already planted along river banks and dam site have been cut down as a result of the training.
4. Project management

Rationale for Dam Rehabilitation and Spring Protection

- The dam was $\frac{3}{4}$ filled with silt and thus the water capacity was inadequate
- Water scarcity during dry season was prevalent due to siltation,
- People were bathing and washing clothes on the banks of the dam leading to contamination of dam water
- People were also fetching water inside the dam with donkeys, which often polluted the water.
- Livestock used to drink water inside the dam and after were often stuck in mud
- Incidents of water borne diseases was high

The dam serves 100 families, primary school with over 800 pupils, market, dispensary, rural centre, 5000 animals per day, and a radius of 9km during dry season. The committee in charge of the dam intends to supply piped water to the centre, schools, dispensary and individual households, which had already applied and was waiting pumping of the water to a dam on higher ground that was already constructed. Pipe network was already laid down and was awaiting rehabilitation on the blocked sections. Water engineer took samples of water quality but the result was not with the committee and thus it was not confirmed whether in deed the water was tested or not. The committee was not yet registered as a Water Users Association, which poses potential management conflicts in future if independent individuals register and apply for administration of water.

Negative Environmental Impacts

- Potential contamination from the waste oil emanating from the generator set.
- Potential breeding site for mosquitoes and other water borne diseases like bilharzias
- Potential conflict over water use
- There were no laws and/or regulation for water use, access and management both for dam site and catchment.

Screening Form duly filled as communicated to the consultant by the DSG but records to show evidence cannot be traced.

Existing Mitigation Measures in place

- A committee for managing the water project is in place. The committee was composed of people within the dam catchment. The committee has been trained in catchment area management, soil and land management of the dam site and surrounding land use to prevent further siltation of the dam, the need for tree planting along river banks and dam site, suitable species of tree catchment management
- Trees have been planted along river banks and dam site have been cut down as a result of the training.
- Fencing has been done with a barbed wire and reinforced with a wire mesh and has a lockable gate to prevent contamination
- Two bathrooms, one for female and another for the males had been put up and constructed

Recommendations for EMP

1. Development of environmental management plan for waste oil disposal emanating from the generator.
2. Introduction of fish in the dam to feed on mosquito larvae and also act as income generating activity.
3. Planting of more trees and tendering them within the dam site and along the perimeter fence.
4. Formation of water users association for water service delivery and management.
5. Regulations should be established for the use, access and management of the dam and dam catchment
6. Testing of water for water quality
7. Establish a tree nursery for supply of seedlings to the residents within the catchment as well as income generating activity.
8. Establishment of silt traps
9. Training of DSG on environmental management as a form of capacity building should be undertaken
10. Community committee in charge of water projects should be capacity build in financial, managerial, conflict resolution and environmental issues
11. Screening list developed and applied is not suitable for the local situation. Therefore the form should be tailored to suit location conditions
12. EMP should be established before communities are handed over projects and they should be trained on it
13. Participatory planning in all projects should be mandatory for sustainability

3.1.24 Chemsik Pan Rehabilitation

This water pan was constructed in 1986 by the Kenya Freedom for Hunger Walk to provide water for livestock and for domestic use for the residents in the area. The water pan was desilted last year. It was already full of silt and the residents were travelling long distances to water their livestock and fetch water for domestic use.

The rationale for Pan Rehabilitation was

- The dam was $\frac{3}{4}$ filled with silt and thus the water capacity was inadequate
- Water scarcity during dry season was prevalent due to siltation,
- Livestock used to drink water inside the dam and after were often stuck in mud
- Incidents of water borne diseases was high

The pan is permanently guarded by elders whose meeting and information exchanging ground is at the pan site. The committee is composed of mainly elders who have formulated laws and regulations for use, access and management of the pan. Two of the committee members have been trained on management of the water pan and the two have already explained to the other committee members what they need to do for sustainability of the pan.

Negative Environmental Impacts

- Potential breeding site for mosquitoes and other water borne diseases like bilharzias
- Potential conflict over water use
- Localized soil erosion in the project site due to excessive trampling by livestock
- Observed soil erosion along excavates walls and immediate vicinity

Screening Form duly filled as communicated to the consultant by the DSG but records to show evidence cannot be trace.

Existing Mitigation Measures in place

- Stabilization of embankment
- Revegetation of devegetated areas
- The pan is double fenced with a path in between for inspection
- Trees have been planted to provide adequate shade and protection of pan from erosion.
- A series of stone gabions raised to about ½ m have been put along the channel leading to the pan. They are effectively trapping the silt and preventing siltation of the water pan.
- Diversion channel have been designed to control cases of excess water

Recommendations

1. Stabilization of walls and embankment is required periodically
2. The water pan should be fenced using local vegetation that can effectively fence off the area and do not end up attracting livestock
3. Use of cultural mosquito repellents like cow dung to combat malaria
4. Boiling of water before consumption
5. Avoid drawing water when in direct contact with the water body
6. Establishment of silt traps
7. Training of DSG on environmental management as a form of capacity building
8. Community committee in charge of water projects should be capacity build in financial, managerial, conflict resolution and environmental issues
9. Screening list developed and applied is not suitable for the local situation. Therefore a new friendly and adaptable screening checklist should be established.
10. EMP should be established before communities are handed over projects and they should be trained on it
11. Participatory planning in all projects should be mandatory for sustainability
12. Donor and government funded projects should have a component of EIA/EA as at the moment it is not.

3.1.25 Excavation of Temburion Water Pan

Project Description

Temburion water pan is located in Nyinyang West sub location, Kositei location in Nyinyang division of Baringo East. The water pan was excavated with the support of the ALRMP II after the local communities made a request to ALRMP II for the provision of this facility because of the acute water shortage experienced in the area. The pan was constructed in April 2006 a few months back and the banks of the pan have been well raised adequately and the thickness adequate. The project site is sandy in terms of the soils. The pan is expected to provide water for human and livestock and expected to benefit approximately 2,500 people living around the area. It is approximate that over 4,000 heads of cattle and 8,000 goats rely on the excavated water pan for water.

Negative Environmental Impacts

- Potential breeding site for mosquitoes and other water borne diseases like bilharzias
- Potential conflict over water use

- Localized soil erosion in the project site due to excessive trampling by livestock
- Observed soil erosion along excavates walls and immediate vicinity
- Siltation of the water pan

Screening Form duly filled as communicated to the consultant by the DSG but records to show evidence cannot be trace.

Existing Mitigation Measures in place

- The water pan is permanently guarded by elders whose meeting and information exchanging ground is at the pan site.
- The committee is composed of mainly elders who have formulated laws and regulations for use, access and management of the pan.

Recommendations

1. Stabilization of walls and embankment is required periodically
2. The water pan should be fenced using local vegetation that can effectively fence off the area and do not end up attracting livestock
3. Use of cultural mosquito repellents like cow dung to combat malaria
4. Boiling of water before consumption
5. Avoid drawing water when in direct contact with the water body
6. Establishment of silt traps
7. Training of DSG on environmental management as a form of capacity building
8. Community committee in charge of water projects should be capacity build in financial, managerial, conflict resolution and environmental issues
9. Screening list developed and applied is not suitable for the local situation. Therefore a new friendly and adaptable screening checklist should be established.
10. EMP should be established before communities are handed over projects and they should be trained on it
11. Participatory planning in all projects should be mandatory for sustainability
12. Donor and government funded projects should have a component of EIA/EA as at the moment it is not.

4.0 Baseline Environment

This chapter describes the overall baseline condition of the Arid and Semi-Arid areas in Kenya in general and more specific to the 22 districts where the ALRMP II is implementing its activities.

The description is background detailed information of the general environment of the areas including the climate, soil type, rainfall patterns, hydrology among others. The baseline description also includes the socio-economic parameters of the ASALs namely the population and demographic dynamics, education, health and economic activities among others.

Political and administrative boundaries as well as the sizes and location of these districts provide the background of the political environment of the ASALs.

The Arid and Semi Arid Lands (ASAL) of Kenya cover about 466,000 Km² or 88% of the total area of the country; the annual rainfall ranges between 125 - 1250 mm. The main economic activity of ASAL areas is livestock production. Currently, ASAL's account for 50% of Kenya's livestock ("<http://www.alrmp.co.ke>")

The Arid Land Resource Management Project (ALRMP I) covered the following arid districts: *Turkana , Marsabit , Moyale , Mandera , Wajir , Garissa , Tana River , Isiolo , Samburu , Baringo*

The ALRMP II will in addition cover the following districts in the Semi Arid areas: *Kitui , Mwingi , Makueni , Tharaka , Mbeere , Kajiado , Narok , Trans Mara , West Pokot , Laikipia , Kieni East and Kieni West in Nyeri District*

The project area will cover approximately 453,961 Square kilometers and an approximate total population of 5.8 million people.

4.1 Project Ecological Zones

Eleven out of 72 districts in Kenya are classified as arid, 19 as semi-arid and another six as those with high annual rainfall but with pockets of arid and semi-arid conditions. A total of 36 districts fall under ASALs. These districts cover about 467,200 square kilometres or about 80% of the country's total landmass. Table 2 provides information on the classification of different ASAL districts based on the degree of aridity.

Figure 2. ASAL Districts Classified by Extent of Aridity

Category	Districts	% Total ASAL
A. 100% ASAL	Turkana, Moyale, Marsabit, Isiolo, Wajir, Mandera, Garissa, Ijara	62%
B. 85-100% ASAL	Kitui, Makueni, Tana River, Taita Taveta, Kajiado, Samburu	25%
C. 50-85% ASAL	Machakos, Mwingi, Mbeere, Tharaka, Laikipia, West Pokot, Kwale, Kilifi, Baringo, Meru North	8%
D. 30-50% ASAL	Lamu, Narok, Transmara, Malindi, Keiyo, Marakwet	3%
E. 10-25% ASAL	Nyeri (Kieni), Rachuonyo, Suba, Kuria, Thika, Koibatek	2%

Source: Adapted from the 1992 ASAL development policy

4.1.1 Climate

Based on moisture index, there are 30 districts with an evapo-transpiration of more than twice the annual rainfall in 30% of the district's area. Another six districts have small pockets of arid and semi arid conditions making up to 2 % of the total ASALs.

The arid districts are characterised by high ambient temperatures with a wide diurnal range. In most districts, evapo-transpiration rates are more than twice the annual rainfall. These districts receive low and erratic bimodal rainfall that is highly variable both in space and time. In most cases, rain falls as short high intensity storms that produce considerable runoff and soil erosion. Average rainfall figures are deceptive in these circumstances because there tends to be a few years of rainfall well above average whilst the probability of occurrence is low. Approximate rainfall expectancy in the arid districts ranges from 150-450 mm in a year. The soils are highly variable. They are generally shallow, of light to medium texture, with low fertility and are subject to compaction, capping and erosion. Only a few areas have volcanic soils and alluvial deposits which are suitable for crop production. Heavy clays also occur, but cultivation is difficult due to their poor workability as well as problems with salinity and sodicity. Water availability and accessibility is highly variable and is a considerable constraint to production.

4.1.2 Livelihoods

The arid districts are mainly inhabited pastoralists and agro pastoralists. Large areas of the arid districts are suitable only for nomadic livestock production. These pastoralists/agro-pastoralists own about 50% of the national cattle and small ruminant herd and 100% of the camel population. Pastoralist systems contain huge amounts of critical human (language, indigenous technical knowledge, culture) and natural (uniquely adapted breeds) capital.

4.1.3 Soils

Soils in semi arid areas are generally low in organic matter due to low plant density and fast microbial activity. They have poor fertility and are inherently shallow, permitting only limited water retention capacity. The soils are highly erodable due to poor soil structure and texture, low vegetation cover, and high rain intensity. This increases their susceptibility to degradation. Specific soil and water conservation and organic farming techniques will be supported in order to improve soil fertility and to prevent land degradation. Agro-forestry will be supported while mixed farming will continue to be encouraged. Land tenure and ownership is a key area of intervention. Land adjudication has only been done in a few ASAL districts. The ongoing review on land ownership and land tenure should tackle problems of land ownership and therefore increase the motivation of farmers to invest in their land.

4.1.4 Demography/ Population

According to the 1999 human population census, 9.86 million people (or 34.36% of the country's population) were living in arid and semi arid areas of Kenya. Of these, an estimated 13.15% lived in the arid districts of Turkana, Moyale, Marsabit, Isiolo, Wajir, Mandera, Garissa and Jjara. The population density in ASALs varies from a low of 2 persons per square kilometre in Marsabit to a high of 329 persons per square kilometre in Thika district. The low population density coupled with the migratory nature of the inhabitants creates difficulties in the provision of essential social services such as schools and health facilities. With increased population pressure in the high rainfall districts, however, significant immigration is currently taking place particularly in districts that are 50-85% ASAL. For example, Machakos district's population density has increased from 50 persons per square kilometre in 1979 to 144 persons per square kilometre in 1999. The ASAL human population is rising due to natural growth and immigration from densely populated areas thereby putting extra pressure on existing resources.

Semi Arid

These districts receive between 500 and 850mm of rainfall annually. They are characterized into four categories, namely, a) semi-arid areas with mixed rain-fed and irrigation agriculture and high economic and political disparities; b) semi-arid areas with encroaching agro-pastoral use by marginalized smallholders; c) semi-arid areas with predominantly pastoralist use in the economic and political periphery; and, d) semi arid areas that include protected areas and their surroundings. Examples include Kajiado, Narok and Transmara, Laikipia, Baringo, parts of Samburu, parts of Marakwet and West Pokot, parts of Meru north and

central, Tharaka, Mbeere, Mwingi, Kitui, Machakos and Makueni. Also covered under this category is the entire coast, except Tana River district and some small part of central Kenya. These districts fall into two agro-ecological zones (AEZ); AEZ IV and AEZ V-VI.

In AEZ IV, the main farming system is mixed crop-livestock production. Crops are grown to meet household subsistence needs and surplus is sold for cash to supplement household income. Local breeds of livestock predominate, with bulls mainly being used as a source of draft power for ploughing and transportation. Livestock are, in general, an insurance against crop failure and are usually allowed to graze fields after harvest. Some farmers also use animal manure on their fields. Inadequate rainfall and a high incidence of pests pose high risks. To minimise these risks farmers keep livestock, practice mixed cropping, and plant more drought tolerant crops such as cow and pigeon peas.

In AEZ V-VI, the main farming system is the maize/cowpea/pigeon pea. This system is practiced in the low-lying areas which have been rapidly settled and sub-divided into family farms in the last one or two decades. Almost all the farmers grow maize, but the rate of failure is very high. Soil erosion, low fertility and frequent droughts are the major production constraints. The zone is ideally suited for sorghum and millet but maize is increasingly grown. Ownership of livestock, especially goats, is widespread, a quarter of the households own no livestock and depend primarily on subsistence cropping and the provision of labour. Where they exist, animals are grazed communally and are moved away from the homestead during the dry season. Examples under this zone include parts of Keiyo, Marakwet, Tharaka, some parts of Kilifi, parts of Baringo and West Pokot.

Semi-arid areas also host most of the protected areas such as game reserves, national parks and forest areas. These areas include parts of Laikipia, Baringo, Nakuru, Kajiado, Narok, Transmara, Samburu, Meru North, Makueni, Mwingi, Marakwet and West Pokot. Other districts include Marsabit, Isiolo and Turkana.

Livelihoods of both arid and semi arid lands depend upon available natural resources, particularly soil and water. Due to ecological and climatic constraints, the main source of livelihood for ASAL inhabitants is extensive livestock production.

4.2 Districts Project Areas

4.2.1 Mbeere District

It is located in Eastern Province. It is bordered by Embu district to the North West, Meru south district to the north, Tharaka district to the North east, Mwingi district to the south and south east and Kirinyaga district to the west. It has an area of approximately 2097 Km².

The area lies at an altitude of 1200m-500m above sea level and is generally semi-arid. It experiences long rains between March and May and short ones from October to December. Terrain slopes in a North-West to a South-East direction. The area is sloppy in nature.

The resources in this area include fisheries, Kiang'ombe hill forest, wildlife, Mwea National reserve and water resources. Mwea National Reserve is situated in this area and is under the management of Kenya wildlife service.

The area has a population of 180,000 people. The people in this area mostly practice agriculture, ranching, bee keeping, horticulture, sand harvesting and harnessing hydro-electric power.

4.2.2 Isiolo District

It is situated in Eastern Province and has an area of 25,605km². It is bordered by Marsabit district to the north, Garissa and Wajir district to the south east and east respectively.

The climate is generally hot and dry with a temperature average of 27°C. The area has two rainy seasons where the short rains occur between October and November and the long ones occur between March and May. The average rainfall is 580.2mm. However, the rainfall is usually erratic and cannot support crops thus enhancing poverty in the area.

The terrain is generally flat with low-lying plains that rise gradually from an altitude of 200 meters above sea level at Lorain swamp.

The resources in this area include minerals such as red and green garnet, blue sapphire, mica and marble. Wildlife also exists in this place.

The area has metamorphic rocks and olive basalt rocks. There is also black cotton soil especially around the Kina region where the altitude is higher and crops are rain fed. The area has perennial rivers such as Ewaso Nyiro, Isiolo, Kinna and Bisanandi. Tana River also crosses this district.

The area has a population of 118,222 people. In this area, people practice agriculture and eco-tourism

4.2.3 Marsabit District

Marsabit District in Eastern Province occupies the extreme part of Northern Kenya. It borders Samburu District to the south, Turkana district to the West, Isiolo district to the East, Moyale district to the North East and Republic of Ethiopia to the North.

The district covers an area of 66,000 Km², which includes 4,956 Km², covered by Lake Turkana. It is the second largest district in the country accounting for 11% of the total area of the country.

The district is located in the driest region of the country with low rainfall combined with high temperatures result results in potential evapo-transpiration rates that exceed annual precipitation leading to a marked moisture deficiency. The district receives between 200mm to 1000mm of rainfall per annum, but is usually unreliable between October and November. The temperatures vary from 18°C to 23°C and the average temperature is 20.5°C.

The key natural resources in the district include:

- Water from the ground and seasonal rivers such as Milgis and Merille
- Forests such as Marsabit which is gazetted and others found in Hurri hills, Kulal Mountains and Sololo hills.
- Wildlife such as elephants, greater kudu, lions, leopards, zebras, rhinos and reticulated giraffes.
- Minerals such as gypsum, graphite, corundum, salt deposits and talc.
- Fisheries from Lake Turkana which are mainly for commercial exploitation. The types of fish include tilapia, Nile perch, Barbis and Distichodus Niloticus

The area is generally plain, lying between 300meters and 900meters above sea level. It slopes gently towards south east. The plains are broken by calderas and the area is bordered by hills and mountain ranges.

The area has no permanent rivers. The seasonal rivers include milgis and merille, which drain into sori adio swamp. Most people in this area rely on ground water sources.

The higher parts of Kulal Mountains and Marsabit and Hurri hills have rich volcanic soils which are well developed and have high water retention capacity. The Sololo and Moyale escarpments have vertisols which are rich in organic and inorganic mineral contents. Luvisols are found in the foothills of escarpments.

Approximately 75% of the district is classified as rangeland and nomadic pastoralism is the main source of livelihood. Agricultural activities are concentrated around Mt. Marsabit and covers only about 1% of the total land area. Economic activities include ranching tourism and micro-enterprises. The population is 127,560 people according to the 1999 national census and has an annual growth rate of 2.1%.

In this area, the Marsabit national reserve is the only gazetted reserve and is under the management of the Kenya Wildlife service. Various animals are found in this place and they include elephants, rhinos, lions, greater kudu, zebras and reticulated giraffes.

4.2.4 Mwingi District

It is located in Eastern Province. It has an area of 10,030.3km². It is bordered by Kitui District to the south, Machakos to the west, Mbeere and Meru south to the north and Tana River district to the east.

The terrain is generally plain with a few inserbergs, in Mumoni, Nuu and Migwani divisions. The highest point of the district is Mumoni hills, with an altitude of 1,747m above sea level. The land is generally flat, with a plain that gently rolls down towards the east and northeast where altitude is as low as 400m.

The district has red sandy soils, loamy sand soils and patches of black cotton soils. River valleys have saline alluvial soils of moderate to sometimes high fertility. Otherwise, soils are of low fertility and prone to erosion. Most hills are covered by shallow and stony soils unsuitable for crop farming.

Climate of the district is hot and dry for the better parts of the year. The maximum mean annual temperature ranges between 24°C and 26°C. The maximum mean annual temperatures in the district vary between 14°C and 22°C. Average annual temperature is 24°C. The district has two rainy seasons, i.e. March, May (long rains) and October-December (short rains). Rainfall ranges between 400mm and 800mm per year, but is erratic. The short rains are more reliable than the long rains in the district making it peculiar to the rest of the country.

In Migwani, Central and Mui divisions, crop farming is more prominent than livestock keeping because of higher amounts of rainfall received. Currently the district has two agro-ecological zones i.e.

- Mixed farming zone
- Agro-pastoral zone

4.2.5 Nyeri District

Nyeri District is one of the seven districts of Central Province and forms part of Central Highlands. The district borders Laikipia District to the North, Kirinyaga District to the East, Murang'a District to the South, Nyandarua District to the West, and Meru Central District to the North East. It covers an area of 3,266 km

The area receives two rainfall seasons, long and short rains. The long rains, 1,500mm, occur from March to May while short rains, 900mm fall from October to December although this pattern is occasionally disrupted by abrupt and adverse climatic conditions. The District experiences Equatorial rainfall due to its location and being within the highland equatorial zone of Kenya. Dry areas of the District receive rainfall ranging from

500mm in Kieni Plateau to 1,500mm in the Aberdare ranges and around Mt. Kenya. The rainfall is influenced by the rain shadow caused by Mt. Kenya and the Aberdare Ranges. Temperatures are lower in the high areas like the slopes of the Aberdare Ranges which experience colds of up to 13°C but can go down to 8°C in the cold seasons of June and July. In the lower areas of Mathira, Tetu, and Othaya, the temperatures are about 17°C. Kieni East and West are the hottest regions in the District. Hot seasons fall between January and March with the average temperature for the District being 28°C. January is the month with the highest temperature of 29°C, July with the lowest of 9°C and the average for the District is 16.8°C.

It lies between 3,076 m to 5,188 m above sea level. The main physical features are Mt. Kenya 5,199m to the East, and the Aberdare Ranges 3,999m to the West. The western part of the District is flat, further southwards the topography is characterized by steep ridges and valleys occasionally interrupted by hills such as Karima, Nyeri, and Tumu Tumu.

The natural resources in this area are

- Forest resources like the Aberdares and Mt. Kenya forests which are a source of timber, fuel, fodder, herbal medicine and serve as water catchment areas.
- Rivers - Major rivers include Chania and Sagana and numerous streams.
- Mining - Quarrying of building stones.
- Wildlife.

The main land uses in this area include agriculture, livestock keeping, wildlife conservation, forestry and aquaculture. Urbanization is rapidly increasing in this area thus the need to build more social amenities such as schools and hospitals. Roads and railway lines also exist to facilitate transport.

Nyeri District has a population of 677,216. Rural population is 499,152 while the urban population is 175,289 persons. The population density varies with divisions. Highest density is within the Municipality at 610 persons per square kilometre. The lowest density is within Kieni West division at 112 persons per square kilometer.

Current population pressure and resultant unsustainable natural resources utilization has accelerated degradation leading to poverty, decline in food production, and quality and quantity of water, loss of biodiversity and pollution among others. Aberdares and Mt. Kenya catchment areas have been put under severe pressure through unsustainable exploitation.

The District has two forest ecosystems namely, Aberdares and Mt. Kenya under the jurisdiction of the Forest Department and Kenya Wildlife Service. There also exist other isolated forested hills under local authorities such as Karima, Tumutumu, and Gatumbiro. The forests are wildlife habitats with a wide range of biodiversity.

4.2.6 Baringo District

It is located in the northern part of Rift valley province. The district borders Turkana district to the north, Samburu and Laikipia districts to the east, Koibatek district to the south, and Keiyo, Marakwet and West Pokot districts to the west. It has an area of 8655km².

The area is generally hot and has an average temperature of 25°C. The temperature ranges from 16°C to 35°C. The area receives low to average rainfall where the annual average rainfall is 1200mm. The lowlands are very dry. The altitude ranges from 600meters to 2300meters above sea level. In the valleys, there are alluvial soils while in the highlands such as Tugen hills; there are fertile volcanic soils that are good for farming.

There are three lakes in Baringo district namely Baringo, Bogoria and Kamnarok. There are also perennial rivers such as Perkerra, Molo and Kerio. However, there is still scarcity of water despite the presence of these water resources.

The area has forests situated in Tugen hills and Muchongoi division. The vegetation type in this area is generally of grassland and bush land types, which are both indigenous and exotic. The indigenous species are Podo, Cedar, Oleafricana and Waibugia, while the exotic ones include cypress, eucalyptus and pinus.

The area has a population of 286,643 according to the district development plan of 2002-2008. The major activities that take place in this area are ranching, livestock keeping, agriculture and fishing. They grow crops such as maize, beans finger millet and cassava. Their income comes from agriculture, rural self employment and wage employment. The major cash crops grown are coffee, pyrethrum and maize.

4.2.7 Narok District

It is located in south west of the country, in rift valley province. The district borders Tanzania to the south, Transmara district to the west, Bomet and Nakuru district to the north and Kajiado district to the east. It has an area of 15087.8 km² according to the 2002-2008 district development plans. The area has a population of 365,750 people

The rainfall in this place is unreliable in the lowlands but reliable in the highlands. It ranges from 1200mm to 1800mm per annum. The temperatures vary from 10°C to 15°C in the highland but the mean average temperature is 28°C.

The altitude ranges from 1000meters to 2300 meters above sea level. The area has permanent rivers such as Ewaso Nyiro whose tributaries are siapai and Narok. These tributaries drain into Tanzania. In the highland areas such as Mau and Olokurto, there are fertile soils while in the lowlands, the soils are poor in quality.

The activities in this area include agriculture, ranching and fishing. The main crops grown especially in the highlands are wheat, barley, maize, beans and potatoes. In the lowlands where soils are poor and cannot support crops, nomadic pastoralism is practiced especially by the Maasai. Some quarrying is also done around Narok town. People in this area get their income from rural self employment, wage employment and urban self employment.

4.2.8 Ijara District

It is one of the four districts of north eastern province. It was carved from Garrissa district in 1998. The district borders Garrissa district to the north, Lamu district to the south, Tana River district to the west and the republic of Somalia to the east. It covers an area of 11,332 km².

Low undulating plains dominate the topography of the district with an altitude ranging from 0-90m above sea level. Falling within agro-ecological zone IV, the district has a complex ecosystem of coastal tropical forests, riverine forests and arid woodland habitats with diverse natural resources. It is one of the most pristine biodiversity rich habitats for wildlife species. Rare species such as the Hirola antelope (Beatragus Hunter) and the African wild-dog are found here.

The district is generally semi-arid with high temperatures (ranging between 15°C and 38°C) most of the year with relatively cooler periods between the months of April and august. Rainfall is bimodal occurring in April to May and November to December with the mean annual totals ranging between 500-700mm. However, this is erratic and unreliable.

The area has black cotton soils and alluvial soils and therefore can be used for livestock rearing and arable for agriculture.

The majority of the population practices pastoralism, although adoption of sedentary lifestyle by people in the district is on an increasing scale. The coastal climatic influence and river Tana that traverses the western edge of the district have greatly contributed to the patterns of settlements and types of socio-economic activities practiced.

At present, there are four conservation areas within the boundaries of ijara or that it shares with neighboring districts of Garissa, Lamu and Tana River. These are Arawale Game Reserve, Boni, Tana River primate reserve and the Dondon forest reserve.

4.2.9 Garissa District

It is one of the three districts in north eastern province. The district borders Wajir district to the north, Lamu district to the south, Tana River and Isiolo districts to the west and Somalia to the east. It has an area of 43,931 km², about 7.45% of the country.

The area is low lying and ranges from 70meters to 400meters above sea level. It is devoid of mountains, hills or valleys thus making the movement of livestock to look for pasture easy.

The area is generally hot and dry throughout the year with temperatures ranging from 20.5°C to 38°C. The rainfall ranges from 23.6mm to 34.2mm per annum. There also occurs erratic rainfall and frequent drought.

The area has two permanent water sources which are Tana River and a small fresh water lake in Ijara. Rain water is also harvested in water pans. However, there is usually scarcity of water and women and children walk 15-30km in search for water.

Natural resources

- Mangrove forests especially at the banks of Tana River and woodland forests
- Mining of sand for building
- Wildlife which are a source of tourist attraction
- Fisheries from river Tana

The area is semi-arid and soils range from sandstones, dark clay to alluvial soils along the river Tana basin. Alluvial, grey cotton, black cotton, white and red sandy soils also exist in this area.

4.2.10 Moyale District

Moyale is one of the thirteen districts that make up eastern province. It covers an area of 9,390.3km². It borders the republic of Ethiopia to the north, Marsabit district to the southwest and Wajir district to the southeast. It lies between latitude 02°11 north and 02°4 north and longitude 38°16 east and 39°21 east.

The district lies within the semi-arid zone of Kenya. It has diverse physiographic and natural conditions ranging from high plateau hills (800-1200m) along the Kenya- Ethiopia border to flat low lying plains (500-800m) stretching further south to the neighbouring districts of Wajir and Isiolo. The entire northern side bordering Ethiopia is surrounded by mountains rising up to 1517m above sea level while the lowlands are mainly flat with an average altitude of 900m above sea level. These highlands are mostly the source of surface water that is used by pastoralists during the dry spells.

Floods from the Ethiopian highlands during the rainy season are known to first affect most roads, which become impassable. Construction of roads is expensive in regions bordering this area.

The soils found in this district consist of both the black cotton and the rocky stony lava soils. The black cotton soils have alluvial accumulations that are ideal for growing of crops like maize, millet, fruits and vegetables. These soils are common around Sololo and Moyale town. The rest of the district consists of rocky and stony lava plains, which do not support agricultural production but are suitable for shrubs and bushes, which form the main source of food for the diverse animals found in the region.

The district is generally hot with temperatures varying from 20°C to 36°C. The months of January to March and September to October record the highest temperatures with an average mean of 30°C while the months of June to July have the lowest temperatures averaging 24°C.

The district has no permanent rivers. The seasonal rivers emerge during the long rains and dry up during the dry seasons thus making the districts prone to acute shortages of portable water. It has unpredictable bimodal rainfall pattern averaging 300mm per annum during the long rains (March-May) and 250mm during the short rains (October – December). This low rainfall coupled with high evapo-transpiration rates tends to reduce crop productivity thus making the district vulnerable to drought leading to reliance of relief food throughout the year.

The vegetation type in the district varies considerably with lowlands having natural vegetation ranging from open grassland to shrubs lands and deciduous trees while the cooler highlands are often covered by mist particularly during the rainy seasons with the vegetation changing to thick bush. This type of vegetation forms a good habitat for wildlife and grazing ground for livestock especially goats, sheep, camel and cattle which form the major source of income for people in this region.

4.2.11 Laikipia District

Laikipia district is one of eighteen districts of Rift-Valley province. It borders Samburu district to the north, Isiolo to the northeast, Meru central to the south, Nyandarua and Nakuru districts to the southwest and Koibatek and Baringo districts to the west. It lies between latitudes 0°18" and 0°51" north and between longitude 36°11" and 37°24" east. It covers an area of 9,693km².

The altitude of the district varies between 1,000m above sea level at Kipsing plains in the north and 2,600m in the south. The maximum height of 2,600m above sea level is found around Marmanet forest. The other areas of high altitude are around Mukogodo and Loldaiga forests to the east.

The district consists mainly of plateau bounded by the Great Rift Valley to the west and Aberdare and Mt. Kenya Massifs to the south. In the northwest the plateau descends towards the floor of the Rift Valley, while in the north and east it extends over many hundreds of kilometers towards the north. Although Mt. Kenya is situated to the southeast of Laikipia district, it does not form part of the district but has significance on development endeavours.

The eastern side of the district is comparatively dry and low, due to its leeward position and is mainly used as pasture land except for mountain slopes and forest zones.

The level plateau and the entire district drainage is dominated by the Ewaso Nyiro and its tributaries which have their catchments in the slopes of the Aberdares and Mt. Kenya and flows from south to north. The tributaries include Nanyuki, Rongai, Burguret, Segera, Naromoru, Engare, Moyak, Ewaso Narok and Ngobit rivers. The flow of these rivers indicates that the district slopes gently from the highlands in the south to the lowlands in the north. The rivers determine to a large extent the settlement patterns, as they are a source of water both for human and livestock consumption and irrigation activities.

There are two major swamps in the district which are virtually undeveloped, namely: Marura swamp which runs along the Moyot valley in Ol Pajeta ranch and the Ewaso Narok swamp around Rumuruti Township. The swamps have some agricultural potential if properly protected and managed. However, they are currently under pressure through drainage for settlement and agricultural production.

The high and medium potential land forms 20.5% of the total district's land area while the rest 79.5% is low potential and mainly non-agricultural land.

The soils in the district can be grouped on the basis of the terrain under which they have developed. They have a high level of inherent fertility and the only limiting factors to agricultural production are the poor weather characterized by frequent dry spells and poor rainfall distribution in terms of space and time and the immigrant inhabitants unwilling to discard their imported farming practices suitable for the high potential areas of central and eastern provinces.

The district has gazetted forests totalling to 58000 ha and these are divided into both indigenous and plantation forests for industrial purposes. The plantation consists of exotic trees and includes Marmanet. The indigenous forests include Mukogodo, which is a unique dry upland forest and Rumuruti, which is under threat from encroachment.

Laikipia district is richly endowed with wildlife, which is widely distributed in the semi arid lands. Most of the wildlife is found in the large-scale ranches, which occupy over 50% of the total area of the district. The rest is found in the unsettled small holdings, group ranches owned by the pastoral Laikipia Maasai and also in the gazetted forests of Mukogodo, Rumuruti and Marmanet. Though this is an important natural resource, it has been a source of conflict with the farming communities. The major five species are the lion, leopard, elephant, buffalo and the other wildlife species which are also abundant.

Other tourist attractions in the district include the unique landscapes like the beautiful Mt. Kenya snow capped peaks, the equator and historical sites such as caves in the mountain region. There are also the unique traditional community lifestyles among the Mukogodo Maasai and the gazetted protected indigenous forests rich in fauna and flora.

4.2.12 Tharaka District

Tharaka district is one of the thirteen districts that form eastern province. It covers an area of 15695km² and borders Meru central district to the north, Meru north district to the northeast, Mwingi district to the southeast, Mbeere district to the south and Meru south district to the east.

Generally, Tharaka district comprises the low, hilly and sandy marginal low lands of the former large meru district. In most parts of the district, soils are sandy and stony. The predominant hills in Tharaka include Kijenge and Ntungi both of which have a fair forest cover. Poor methods of farming and soil conservation have left the earth bare, while charcoal burning and overgrazing have contributed greatly to the current state of the landscape. Due to uncontrolled soil erosion, there are a lot of gullies across most of the landscape.

Numerous rivers which originate from both Mt. Kenya and Nyambene Hills transverse the district flowing eastwards as tributaries of Tana River. This includes Mutonga, Thingithu, Kathhita, Thanatu, Thankatha, Kiyhinu and Aura rivers. These provide water for irrigation in the moderately dense populated locations of Tharaka south division.

The district has a bimodal rainfall pattern with an annual rainfall averaging between 500-800mm per year. Crop failure is frequently experienced and this explains why less area is put under crops. March – May is the short rains season while October – December is the long rains period. Generally, rains in Tharaka are fairly erratic. Temperatures range between 29°C – 36°C though at certain periods they can go up to 40°C.

4.2.13 West Pokot District

West Pokot is one of the 18 districts that form Rift Valley province. It is situated in the North Rift. It borders Uganda in the west, Tran's Nzoia and Marakwet district to the south, Baringo and Turkana districts to the east and north respectively. The district covers an area of about 9,064km² stretching a distance of 132km from north to south.

The district is characterized by a variety of topographical features. In the southeastern part of the district are Cherangani hills with an altitude of 3,370m above sea level. On the northern and northeastern parts of the district are the dry plains of Turkana with an altitude of less than 900m above sea level. The landscapes, associated with this range of altitudes, can be found along the district boundaries including spectacular escarpments of more than 700m.

The major drainage systems in the district are Turkwel, Kerio and Nzoia Rivers. About 95% of the catchment areas in the district are part of the main Turkwel. The remaining 5% is shared Kerio and Nzoia rivers. Turkwel and Kerio rivers drain northwards into Lake Turkana, while river Nzoia drains into Lake Victoria. The main rivers are Suam, which drain into river Turkwel after the border with Turkana district and Muruny which becomes Weiwei in the lower part. A hydro-electric plant has been set up in river Turkwel in the border of West Pokot and Turkana districts.

The district has a bimodal type of rainfall. The long rains fall between April and August while the short rains are between the month of October and February. There is however, great variation in the amount of rainfall received in the district. The lowlands receive 600mm and the highlands 1,600mm.

The district similarly experiences great variation in temperature. The low areas below 1,750m above sea level have high temperatures ranging between 15°C and 30°C. The high temperature areas also experience high evaporation, which make them less favourable for production of crops. The temperatures and evaporation decreases with the increase in altitude. High altitude areas above 1,750m above sea level experience moderate temperatures and enjoy high rainfall and low evaporation. These areas are suitable for extensive agricultural and livestock production.

4.2.14 Trans mara District

Transmara district is situated in the south western part of the rift valley province. The district borders the republic of Tanzania to the south, Kuria and Migori districts to the west, Gucha and Bomet districts to the north and Narok district to the east. The district covers an area of about 2,932km² of which the famous Maasai Mara game reserve occupies 31km².

The topography of Transmara district comprises two major categories: the highlands which lie between 2,200m above sea level. The highland areas are the main source of permanent and seasonal rivers in the district. The major rivers, which originate from these areas, are the Mara Rivers and its tributaries Mogor, Enkare, Entituak, Orerai and Siteti, which drain into Lake Victoria. The plateau covers the eastern part of Kirindon division, and the southern part of Lolgorian division, parts of Maasai Mara, Murgan, and Soit in Kirindon division, and Masurura in Keiyan division, Kerinkan, Olopikidoge and Angata Barikoi in Lolgorian division.

The district enjoys medium temperatures ranging from 14.8°C – 20.3°C. The highest temperatures occur in February and the lowest occur in June/July. This range of temperatures is as a result of the influence of the high altitude in the district. Other modifying factors are cool winds blowing from Lake Victoria mainly from the month of August to November and also between February and April.

The rainfall is influenced by the passage of inter-tropical convergence zone giving rise to a bimodal rainfall pattern. The breezes from Lake Victoria add to the moisture. Hailstorms are occasionally reported in the west and the highlands north of the district. The long rains are experienced between august and November. The areas, which receive a lot of rainfall, are Keiyan division and the highlands west and north of Kilgoris division. The district records a mean annual rainfall of 1,600mm.

5.0 Institutional, Policy and Legal Framework

This chapter describes the existing institutional and legal frameworks in Kenya that are directly related and influence the implementation of projects in regard to the environment in ASALs. Policies and legal statutes in Kenya play a significant role in ensuring the ultimate protection and sustainable development in Kenya and the focus of this chapter is to highlight the relevant policies and Acts and point out how they relate to the projects being carried out by the ALRMP II.

5.1 Environment Management and Coordination Act 1999

The Environmental Management and Coordination Act (EMCA) 1999 is an Act of parliament that was enacted to ensure sound environmental management of our environment. This Act makes regulations that have led to the establishment of the National Environmental Management Authority (NEMA) Kenya.

The Act in effect vests this authority with the responsibility of ensuring that activities and processes of on going projects are systematically evaluated to ascertain that the activities of such projects and Programmers conform to the approved environmental management plan of that specific project and sound environmental management practices referred to as "environmental audit study". This audit is undertaken with the powers vested from the Act.

This study is based on this legislation that provides for annual environmental audit to be undertaken for projects that have been assessed before.

Part vii section 68 of the Act stipulates that the Authority shall be responsible for carrying out environmental audit of all activities that are likely to have significant effect on the environment. An environmental inspector appointed under this Act may enter any land or premises for the purposes of determining how far the activities carried out on that land or premises conform to the statements made in the environmental impact assessment study report issued in respect of that land or those premises under section 58(2).

- (2) The owner of the premises or the operator of a project for which an environmental impact assessment study report has been made shall keep accurate records and make annual reports to the Authority describing how far the project conforms in operation with the statements made in the environmental impact assessment study report submitted under section 58(2).
- (3) The owner of premises or the operator of a project shall take all reasonable measures to mitigate any undesirable effects not contemplated in the environmental impact assessment study report submitted under section 58(2) and shall prepare and submit an environmental audit report on those measures to the Authority annually or as the Authority may, in writing, require.

69.(1) The Authority shall, in consultation with the relevant lead agencies, monitor:-

- (a) all environmental phenomena with a view to making an assessment of any possible changes in the environment and their possible impacts; or
 - (b) the operation of any industry, project or activity with a view of determining its immediate and long-term effects on the environment.
- (2) An environmental inspector appointed under this Act may enter upon any land or premises for the purposes of monitoring the effects upon the environment of any activities carried on that land or premises.

5.2 The Water Act 2002

The new Water Act (2002) of the laws of Kenya seeks to make better provision for the conservation, control of pollution, apportionment and use of the water resources in Kenya, and for purposes they are incidental thereto and connected therewith. The Act vests ownership and control of water in the government subject to any rights of user. Under this provision the responsibility to regulate access, use and control of water resources is vested in the Water Resources Management Authority (WRMA).

The Water Act protects water bodies and sources from pollution and controls their use by the Company. This Act therefore will govern the activities of the company on terms of water use and disposal to guard against the potential pollution of water from the companies' activities.

The Act also gives provisions for protecting catchments from deforestation. The Minister may designate protected catchment areas, within which activities may be regulated as nearly. However, the water act does not provide for control of other land uses that may degrade the catchment through soil erosion. The Agriculture Act, on the other hand, does provide a framework for dealing with these problems, although these provisions seem rarely to be implemented.

Control of water pollution is covered in a general sense by the Water Act. The legislation is deficient, since it does not lay down water quality and discharge standards or provide powers for these to be defined. It also does not provide for water quality monitoring. The Public Health and Pest Control Products Acts also touch directly or indirectly on water pollution, but there is little institutional capacity to implement their provisions.

The Act is relevant to ALRMP projects that are of water abstraction in nature.

5.3 The Agriculture Act

The Agriculture Act Cap 318 of the Laws of Kenya seeks to promote and maintain a stable and sustainable agriculture, to provide for the conservation of the soil and its fertility and to stimulate the development of agricultural land in accordance with the accepted practices of good land management and good husbandry. This Act primarily guides and regulates farming practices especially in relation to the proximity of farming within the riparian section. The Act specifies that no agricultural activity is allowed and or permitted within the riparian area of a wetland, river or Lake. The Agriculture Act is the principal land use statute covering, *inter-alia*, soil conservation, and agricultural land use in general.

It is, indeed, a crucial piece of legislation insofar as it relates to both small scale and medium-scale farms within the ALRMP areas and catchment.

5.4 The Forest Act

The Forests Act, Cap 385 of the Laws of Kenya addresses reservation, protection, management, enforcement and utilisation of forests and forest resources on government land and provides for the establishment, control and regulation of Central Forests, forests and forest areas and on un-alienated Government land in Kenya. The Act, therefore, applies not only to state plantations and land controlled and managed by the Forestry Department for research purposes or for establishment of commercial timber plantations, but also areas which have been set aside for the conservation of fauna and flora, for the management of water catchment area, for the prevention of soil erosion or for the protection and management of indigenous forests on alienated Government land. This Act therefore is of extreme relevance to the project. The arid lands of Kenya support dry land forests that are important banks of biodiversity. Ijara District for example has a forest that is not protected and can be degraded through some of the ALRMPs.

5.5 Public Health Act Cap 242

The Act protects human health. Prevent and guard against introduction of infectious diseases into Kenya from outside, to promote public health and the prevention, limitation or suppression of infectious, communicable or preventable diseases within Kenya, to advice and direct local authorities in regard to matters affecting the public health to promote or carry out researches and investigations in connection with the prevention or treatment of human diseases. This Act provides the impetus for a healthy environment and gives regulations to waste management, pollution and human health.

This Act controls the activities of the project with regard to human health and ensures that the health of the surrounding community is not jeopardized by the activities of the project such as water development.

Some of the ALRMPs can be a public health hazard as well as beneficial to the greater public health. A case example is of a water pan which can be breeding ground for mosquitoes and other water borne diseases and provision and protection of domestic water

5.6 The Land Planning Act

The Land Planning Act Cap 303 of 1968 of the Laws of Kenya makes provision for planning the use and development of land. Sec 6 (1) of the subsidiary legislation provides that *"a local authority may, after consultation with, and with the agreement of the Minister, prepare and submit to the Minister for his approval an area plan, as the case may be, for that part of the area under its jurisdiction to which these regulations apply."*

5.7 Physical Planning Act

This Act provides for the preparation and implementation of physical development plans for connected purposes. It establishes the responsibility for the physical planning at various levels of Government in order to remove uncertainty regarding the responsibility for regional planning. A key provision of the Act is the requirement for Environmental Impact Assessment (EIA).

It provides for a hierarchy of plans in which guidelines are laid down for the future physical development of areas referred to in a specific plan. The intention is that the three-tier order plans, the national development plan, regional development plan, and the local physical development plan should concentrate on broad policy issues.

The Act also promotes public participation in the preparation of plans and requires that in preparation of plans proper consideration be given to the potential for socio-economic development needs of the population, the existing planning and future transport needs, the physical factors which may influence orderly development in general and urbanization in particular, and the possible influence of future development upon natural environment.

Any change of use of the actual development without authority constitutes an offence. Similarly, any one who deposits refuse, scrap or waste materials in a designated area without the consent of the planning authority or the relevant local authority shall be guilty of an offence under the regulations. The general sentence under the regulations is a fine of not exceeding five thousand shillings or Imprisonment not exceeding six months, or to both, such fine and imprisonment.

5.8 Draft National Policy for the Sustainable Development of ASAL of Kenya 2005

This policy allows for a pro-poor growth strategy that emphasizes sustainable poverty reduction and economic growth accompanied with appropriate economic policies and adequate investments in these considerably marginalized and vulnerable regions. Since economic growth, poverty reduction and inequality

are inextricably related, the policy document promote changes in resource distribution enhancing equity and access to economic resources while providing viable incentives to pastoralists, agro-pastoralists, small-scale farmers and traders in the ASALs. The strategy underpins the fact that growth policies without effective resource distribution will have limited impact on poverty reduction. The policy framework focuses attention on:

- The need to facilitate the restructuring of the pastoral economy over time towards a market driven economy, where key inputs are accessed through the markets rather than through social networks as is the case currently
- A better understanding of pastoralist and mobile herding livelihood systems while accepting mobile herding systems as a rational and efficient use of dry land resources
- Improving natural resource management and utilisation by strengthening pastoral land tenure systems
- Reducing ASAL populations relying on livestock through human capital development and diversification of income sources
- Improving pastoral productivity by upgrading both the environment and the genetic composition of livestock through selection and improved animal husbandry practices
- Improving markets and providing social services to ASAL communities
- Providing financial services such as appropriate credit facilities to traders, pastoralists and farmers;
- Reducing and managing risks due to drought, floods, food and human insecurity
- Engaging ASAL communities in policy reform and the enhancement of participatory governance and,
- Encouraging stakeholders and policy makers to undertake participatory policy formulating based on objective analysis and research.

The policy provides a framework to reverse the situation in the ASALs districts from one of despair, poverty and need to one of hope and a bright future. The Government aims at taking measures that facilitate the realignment of public expenditure towards investment. The strategy is to improve public investment in the ASALs by taking advantage of the renewed Government commitment to the development of the ASALs. This public investment will hopefully encourage private investment and human capital development in the ASALs. Public expenditure will be targeted to ASAL priorities in order to improve the quality of expenditure and to ensure that the priorities are achieved in an effective and efficient fashion.

5.8.1 ASAL Vision and Strategy

The key of a national ASAL Vision and Strategy is to provide the basis for the implementation of the National ASAL Development Policy. This strategy will assist the actors involved in developing the ASALs to make informed decisions that are aligned to community and national aspirations. The specific focus of the strategy is on how Kenya can achieve sustainable local and national development through proper utilization of the natural resources that are resident in the ASALs.

Benefits of the ASAL Vision and Strategy

The failure of past ASAL policies and development initiatives has resulted in the current gross underdevelopment in the ASALs. This Vision and Strategy is aimed at:

- Establishing realistic and achievable development goals and objectives that are consistent with the aspirations of the ASAL communities
- Providing mechanisms and media for a shared ASAL vision or dream
- Developing a sense of ownership for the strategic development initiatives
- Effectively channelling available ASAL resources to key priority areas in order to avoid duplications and wastage

- Providing a base from which progress can be measured and establishing a mechanism for informed change when needed
- Motivating key development actors around a common vision and mission
- Assisting to address cross-cutting issues
- This strategy will be implemented within ten years and the proposed interventions are closely synchronised with the short and medium terms targets of the draft National Policy for ASALs.

5.9 Forest Policy

Dryland Forestry

Kenya's drylands, although rich in biodiversity are often stressed by frequent drought. Livestock keeping is the main economic activity of these drylands. However, due to population pressure in the high and medium potential areas, there is migration into the dryland areas resulting in depletion of grazing lands, the forest resource and tree cover degradation.

The drylands have the potential to supply marketable commodities on a sustainable basis such as gums and resins, aloe, charcoal, essential oils, silk, edible oil, commercial juices, frankincense, indigenous fruits, honey and timber. These products can go a long way towards improving the livelihoods of Kenyans living in the drylands. In order to improve productivity:

Policy statement 1.5.1: *Forests and other types of woody vegetation in the drylands will be sustainably managed and conserved for the production of wood and non-wood forest products. .*

Policy statement 1.5.2: *The establishment of forest based micro-enterprises and community forest associations will be supported.*

Policy statement 1.5.3: *Degraded and over-exploited areas will be rehabilitated by community forest associations with Government support.*

Policy statement 1.5.4: *Research, technology development, education and training in dryland forestry will be intensified*

Policy statement 1.5.5: *Tree planting in the drylands will be promoted.*

Policy statement 1.5.6: *Community forest associations will be supported to develop management plans and manage community forests.*

Policy statement 1.5.7: *Sustainable commercial production of charcoal will be promoted.*

5.10 Sessional Paper No. 6 of 1999 on Environment and Development

The relevant sections of the draft Environmental policy of 1999 in the ALRMP are in the Range land and land degradation, drought and desertification.

Rangeland Resources

About 80% of Kenya's land area is classified as rangelands, which is characterized by scanty and unreliable rainfall. The rangeland resources are enormous but the ecosystems are fragile requiring appropriate management strategies to ensure sustainable productivity. Animal production through pastoralism and wildlife management is the main form of land use.

The rangeland carries over 25% of total human population; support more than half of the total livestock population and a large number of various species of wildlife. These wildlife species and the human population have co-existed without adverse effects on the range resources for a long time. However, recent

management practices have led to gradual degradation of ASAL areas mainly through increased wildlife and livestock numbers beyond the lands carry capacity. This overstocking has consequently led to overgrazing thus lowering their productive capacities. Loss of vegetative cover has exposed vast areas to unfavourable conditions resulting in soil erosion thus triggering the desertification process. Further, lack of vegetative cover reduces water recharge into subsurface rock formations.

Policies on rangeland have focused mainly on livestock development. These have prompted development of group ranches, company or co-operative ranching as well as communal grazing lands. Current initiatives recognize the changing land use patterns and practices including sub-division of group ranches, crop cultivations and other land use practices and aim to promote sustainable utilization and management practices such as afforestation, integrated wildlife and livestock while providing deterrents to practice that are destructive to the environment.

Institutional and Legal Arrangements

The overall policy formulation for rangelands is under the ministry responsible for ASAL development. Other institutions involved are Office of the President, ministries responsible for planning and national development, environmental conservation, natural resources, Department of Resource Surveys and Remote Sensing as well as national regional development authorities, local authorities, universities, NGOs, the National Museums of Kenya and local communities.

Environmental Challenges

These include:

- Uncoordinated policy and institutional arrangements for rangeland resources management
- Absence of clear policies to support traditional land use practices
- Unsuitable land use practices, including cultivation on slopes and on fragile soils especially in ASALs
- Conflicts arising from land use practices such as agriculture, wildlife and settlement programmes
- Absence of policies and legislation for managing land use change in rangelands
- The need for policies and regulations for sustainable management of land under multiple uses

The Government will endeavour to:

- a. *Develop a comprehensive policy on rangeland resources management;*
- b. *Review and strengthen legislation and regulations pertaining to allocation, demarcation, and ownership over rangelands in order to protect the environment*
- c. *Institute measures to manage livestock and wildlife populations to within the carrying capacity of the land;*
- d. *Discourage inappropriate conversion of ASALs into agriculture;*
- e. *Promote environmentally friendly farming techniques;*
- f. *Promote integration of wildlife and livestock management;*
- g. *Promote wildlife utilization as an alternative form of livelihood;*
- h. *Encourage and support traditional land use practices that are environmentally friendly, such as pastoralism;*
- i. *Make EIA a requirement for all land use changes and activities;*
- j. *Facilitate provision of water for livestock, wildlife and domestic use and develop management techniques for them which incorporate environmental considerations;*
- k. *Formulate policies and regulations for sustainable management of land under multiple uses;*
- l. *Encourage agro forestry and planting of trees suited for ASALs;*
- m. *Encourage collaborative efforts between government, local communities and NGOs in the development of ASALs; and*

- n. *Promote research for understanding the interaction between the fauna and flora and other abiotic components in the rangelands in order to utilize them while maintaining the ecological balance.*

Land Degradation, Drought and Desertification

Desertification is defined as "land degradation in arid and semi-arid and dry sub-humid areas resulting from various factors including climatic variations and human activities." Drought is "the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels causing serious hydrological imbalance that adversely affects land resources production systems."

The ASALs comprise about 80% of Kenya's total land area the remaining 20% are classified as high potential. There is evidence that ASALs are suffering from an increased rate desertification and frequent drought. This situation is further exacerbated by the increasing needs of a rapidly growing population.

Studies have shown that droughts are part of the history of this region-a cyclical reality whose regularity is not clear. Drought reduce availability of food, affect water resources, reduce income, and increase poverty incidence, cause human and livestock deaths and accelerate of land degradation.

The consequences of desertification are loss of productivity of the land, reduced animal productivity, ecological disruption, increased frequency of drought, loss of genetic diversity, degradation of water resources and increased atmospheric dust. Desertification leads to migration of people, social dislocation, social distress and unrest, poor health and quality of life.

Institutional and Legal Arrangements

There are numerous institutions addressing issues of desertification and drought. They range from local grass roots institutions (religious organizations, women and youth groups and group ranches e.t.c), local NGOs, government ministries to international organizations. These institutions look at the problems from a narrow perspective depending on their specific area of interest and mandate.

Environmental Challenges

These include:

- Absence of a national policy on drought and desertification management
- Inadequate scientific and technological knowledge on the status of desertification
- Inadequate capacity and funds to assess and map desertification
- Weak drought monitoring and early warning systems
- Uncoordinated institutional arrangement for addressing issues on desertification and drought

The Government will endeavour to:

- a. *Formulate a drought preparedness policy;*
- b. *Strengthen current drought preparedness and recovery programmes and introduce them in areas where they do not exist;*
- c. *Create awareness on the impact of drought and desertification and introduce adaptive and mitigating measures through training, outreach, programmes and seminars;*
- d. *Develop drought and desertification monitoring and early warning systems;*
- e. *Develop a national monitoring programme with district components to assess trends. These assessments will include socio-economic data and documentation of indigenous knowledge systems and technologies applied in drought and desertification management;*
- f. *Create a national drought and desertification management fund;*
- g. *Build capacity and strengthen, harmonize and coordinate all programmes for assessing and monitoring desertification; and*

- h. *Encourage land management techniques, which promote sound environmental management, while providing deterrents to practice that adversely impact the environment.*

5.11 The World Bank's Environmental and Social Safeguard Policies

The *environmental management framework* document was designed to fully comply with national Environmental codes and legislation in Kenya and with the World Bank's environmental and social safeguard policies.

This section sets out the key safeguard policies that provided the policy context to the EMF including World Bank policies and Kenyan legal requirements on environmental assessment.

As part of the EMF process, proposed micro-activities under the ALRMP II are to be designed at the local level to ensure that they are screened for potential impacts and that they comply with the requirements set out under World Bank safeguard policies.

The ALRMP II will have mostly beneficial impacts on the environment; however, some safeguard policies have been triggered by the project. In accordance with the World Bank safeguard policies, the proposed project has been rated category B under the bank's policy on environmental assessment (OP 4.01), requiring a partial environmental assessment. The project has also triggered the safeguard policies OP 4.04, OP4.36 and 4.09 as indicated in *table below*.

Figure 3 Safeguard policies

Policy	Applicability
Environmental Assessment (OP4.01, BP4.01, GP 4.01)	Yes
Natural Habitats (OP 4.04, BP 4.04, GP 4.04)	Yes
Forest (OP4.36,GP4.36)	Yes
Pest Management (OP4.09)	Yes
Cultural Property (OPN 11.03)	No
Indigenous People (OD 4.20)	No
Involuntary Resettlement (OP4.12, BP4.12)	No
Safe of Games (OP4.37, BP4.37)	No
Projects in International Waters (OP 7.50, BP 7.50, GP7.50)	No
Project in Disputed Areas (OP7.60,BP7.60,Gp7.60)	No

The safeguard policies that were triggered by the ALRMP II are explained as follows:

OP 4.01 (Environmental Assessment)

The OP 4.01 has been triggered because there is the potential that implementation of the ALRMP II may lead to adverse environmental impacts. The EA study, however, has determined that there are no potential large-scale, significant or irreversible environmental impacts associated with the project. The potential impacts identified are mainly localized impacts associated with activities to be financed under the CDD component of the project (i.e school, health clinics/ dispensaries, shelter improvement, water supply, etc), which can be effectively mitigated and are addressed in the EMF identifies the major potential environmental issues that could arise as a result of project interventions and proposes measures to be taken to mitigate these effects, including proposed training and monitoring measures.

OP4.04 (Natural Habitats)

The OP4.04 has been triggered due to the potential nature of ALRMP II activities to border or operate in natural habitat or protected areas. Kenya has a rich biodiversity and a number of protected areas designated by law. The project areas under the ALRMP II encompass a number of natural habitats and / or may border or operate in these areas including two internationally designated areas, Mt. Kulal Biosphere

Reserve and the Amboseli Biosphere Reserve. The EMF will identify any potential impacts that activities to be financed under the project may have on natural habitats, reserves or protected areas in Kenya. Moreover, the ALRMP II will finance under the first project component, *Natural resources and Drought Management*, (a) a baseline natural resources management and ecological survey of the area (aerial and ground), and (b) preparation of a national ASAL Natural Resource Management Strategy.

OP 4.36 (Forestry)

Forests, though not a common feature of the project area, do constitute several important watersheds. Moreover, small-scale infrastructure to be financed under the project may induce pressure in forest resources, mainly the need for wood for construction. To mitigate this concern and comply with the safeguard policy the EMF has provided necessary measures in the screening process to identify impacts on forests and forest resources. Good practice measures are also recommended to address these concerns. Moreover, it is anticipated that the project, through the drought management component, and through enhanced participatory mechanisms, will raise awareness and empower communities to increase protection of fragile watersheds.

Op4.09 (Pest Management)

The Project could conceivably, through promotion of rain-fed or irrigated farming and vaccination crushes, indirectly increase the use of pesticides. In addition, it is conceivable that project funds will be used for animal pesticides, either directly or indirectly. To mitigate against the potential for pesticide use and cumulative impacts of pesticides due to the nature of subprojects, the screening and review system provided in the EMF will identify the potential for subproject to trigger the OP4.09, and will be required (either separately or as an annex to the micro-project EIA). The plan should outline the measures to be taken to ensure that the micro-project does not result in pesticide use or introduction. For potential cumulative impacts as described under the policy, an Integrated Pest Management (IPM) plan recommended during implementation of the project to ensure compliance with the World Bank's safeguard requirements.

5.12 Sessional Paper No. 1 of 1986

Initiatives towards increased investment in the development of Kenya's ASAL started gaining momentum in the mid-1980s following recognition that there was a lot of potential in the ASAL areas which needed to be developed and linked to the economic main stay of the nation; since 1986 the policy of the government have emphasized the development of the arid and semi-arid land areas. Sessional Paper No. 1 of 1986 on Economic Management for Renewed Growth, and the Sixth National Development Plan (1989-1993) both emphasized the need to develop and implement concrete strategies for ASAL land development

5.13 Land tenure systems

Land tenure arrangements in ASALs have constrained social and economic development in ASAL areas as well as led to environmental degradation. The management of land (use, access, control) is, for example, central to pastoral production systems but is poorly recognised in current land tenure arrangements. Land holding arrangements are currently in three legal categories as follows: Government land, Private land and Trust land. In pastoral areas, Trust land is the dominant tenure arrangement. Trust lands are vested in County Councils who hold the land on behalf of residents. However, under the Trust land Act, rights and interests of local communities under customary law are irremediably extinguishable at will through the use of statutory laws. As a result, there has been a trend of giving away Trust land piecemeal through local adjudication processes and continual allocation of chunks of land to individuals or government institutions. Pastoralists have lost land to irrigation schemes, wildlife conservation, military exercise grounds and other uses. If the 'common property rights approach' to utilisation of resources is abandoned, the vast majority of pastoralists stand to lose, as present livestock numbers cannot be maintained unless access is assured to spatially and temporally variable resources. However, at the same time, the current land tenure

arrangements are failing and risk further loss of life and property and intensifying conflict. Land tenure and land ownership among ASAL communities should be adequately resolved through appropriate legal frameworks in order to diffuse inter-ethnic conflicts, competition over critical communal resources and to provide an effective system through which the natural resource base can be improved and managed on a sustainable basis by the communities themselves. Sorting out these land tenure issues in the ASALs is a delicate, intricate, and long-term challenge, which must be faced and resolved at all costs.

5.14 Draft National Land Policy

Kenya has not had a clearly defined or codified National Land Policy since independence. This, together with the existence of many land laws, some of which are incompatible, has resulted in a complex land management and administration system especially in ASALs. The land question has manifested itself in many ways including fragmentation, breakdown in land administration, disparities in land ownership and poverty. This has resulted in environmental, social, economic and political problems including deterioration in land quality, squatting and landlessness, disinheritance of some groups and individuals, urban squalor, under-utilization and abandonment of agricultural land, tenure insecurity and conflict.

This land policy has thus been formulated to address the critical issues of land administration, access to land, land use planning, restitution of historical injustices, environmental degradation, conflicts, unplanned proliferation of informal urban settlements, outdated legal framework, institutional framework and information management. It also addresses constitutional issues, such as *the eminent domain* and *the police power* as well as tenure. It recognizes the need for security of tenure for all Kenyans (all socio-economic groups, women, pastoral communities, informal settlement residents and other marginalized groups).

The Policy designates all land in Kenya as Public, Community or Private. Most significantly, it recognizes and protects customary rights to land. It also recognizes and protects private land rights and provides for derivative rights from all categories of land rights holding. Through the policy, the government will ensure that all land is put into productive use on a sustainable basis by facilitating the implementation of key principles on land use, productivity targets and guidelines as well as conservation. It will encourage a multi-sectoral approach to land use, provide social, economic and other incentives and put in place an enabling environment for agriculture and livestock development.

To ensure sound and sustainable environmental management of land based resources, dealings in such land will be guided by conservation and sustainable utilization principles outlined in national environmental laws and policies. Land management and administration problems (such as systematic breakdown in management, over-centralization, lack of participation by communities, high costs, unnecessary delays) will be addressed through streamlining and strengthening surveying and mapping systems, adjudication procedures and processes, land registration and allocation systems and land markets. To ensure access to justice in land related matters, land dispute institutions and mechanisms will be streamlined through the establishment of independent, accountable and democratic systems and mechanisms including Alternative Dispute Management regimes.

Inefficient and time consuming land information systems have complicated planning, zoning and overall management of land. The Government will prepare and implement national guidelines to improve the quality and quantity of land information through computerization at both national and local levels. This will cover all aspects such as standards, geo-referencing, pre-requisites for LIMS, security, intellectual property rights and land information dissemination and pricing.

Land issues requiring special intervention, such as historical injustices, land rights of minority communities (such as hunter-gatherers, forest-dwellers and pastoralists) and vulnerable groups will be addressed. The rights of these groups will be recognized and protected. Measures will be initiated to identify such groups and ensure their access to land and participation in decision making over land and land based resources.

Institutions managing land in Kenya are many and varied. This structure has performed poorly, is not accessible to the poor, has a poor information system and uses a very complex legal process. The institutional framework will be reformed to ensure devolution of power and authority, participation and representation, justice, equity and sustainability. Three institutions will be set up: the National Land Commission, the District Land Boards and Community Land Boards. A land court and District Land Tribunal will also be established, as will be a National Land Trust to mobilize finances. The Ministry of Lands will continue performing residual roles including policy formulation and implementation, resource mobilization, and monitoring and evaluation.

Lack of land policy in Kenya has made investment in land management in ASALs impossible. The policy if gazetted and implemented will help in conservation of land based resources.

How does land policy related to ALRMP? The project is based in areas where land has been for a long time characterised as marginal and unproductive while we know ASALs are some of the richest lands and the most diverse. The implementation of the policy will contribute in promoting investment in ASALs.

6.0 Environmental Management Plan

This section describe the proposed measures to be implemented in the projects to mitigate impacts identified in the EMF and those impacts that were not covered in the design stages of the project. It forms the Environmental Management Plan document for use in Monitoring and Evaluation as well.

ALRMP II Projects Management Plan Matrix

Project	Activities	Impacts	Mitigation Measures	Monitoring
Nkando Irrigation Project		Water overflows	Channelled back to adjacent collection tank	Water overflows Overflow collection tanks
		Reducing water levels	Maintain the riparian reserve by planting appropriate tree species along the river	Water levels
		Scattered used material in the tank area	Collect and create awareness on waste management on site	Debris and waste on site. No. of awareness campaigns held
		Leakages	Detect and correct the leakages	Water loss quantities
Kilimani Primary school		Devegetation through grazing and browsing livestock in the school compound	Fence the entire compound using barbed wire	Vegetation cover/grass
		Dust inhalation by school children	Plant euphorbia trees around the classes to insulate against excess dust	Dust
		Water leakages from the tank	Monitoring and recording of water usage after installation of water metres as required by the Water Act. Detect and correct the leakages Regular monitoring of piping and tank status	Water loss quantities Maintenance reports Leakages
Bula Mpya Primary School		Open pits	Protect the water pits as long as construction is on course/Plant trees on dry water pits	Open pits on site

		No drinking water in the new site	Connect the new school to tap water	Sources of water on site
		Few pit latrines	Construct more pit latrines in line with requirements of WHO	No. of pit latrines
Mosiro pump feed irrigation scheme-Mosiro location in Narok				
Construction of incinerator at Alango in Garissa	Burning of Health care wastes	Partly burnt health care wastes	Modification of incinerator to increase temperatures & efficiency Add an additional chamber	Wastes from the incinerator
Kiambindu micro irrigation project in Mbeere District	Construction of water weir across the river	The weir is gradually damming the river before the weir	Increase the spillway to reduce water retention period	River bank status
	Digging of canals			
	Canal irrigation	Low flow downstream during dry season upstream	Reduce abstraction during dry period	Amounts of water downstream
		Water abstraction is not metered	Install a master meter	Amounts of water abstracted
Gababa water pan in Ijara District	Clearing of the land	De-vegetation around the pan	Fence the pan	Vegetation cover
	Excavation	Pollution by human wastes and livestock wastes	Site pans a distance from each other	Water
	Flooding of the pan	Soil erosion	Create a watering burrow for livestock away from the pan	Water quality
		Population influx in the area due to the presence of a water source	Plant trees around the pan to prevent soil erosion	Trees planted and erosion indicators
		Increase in prevalence of water borne diseases such as bilharzias, diarrhea and cholera	Treatment of domestic wastes from the water pan	Water borne diseases prevalence

Kasina Earth Dam in Mwingi		Pollution from communities dwelling upstream	Creating awareness to communities on the upstream situation and pollution	Water quality
		Silting of the dam due to agricultural activities around it	Prevention of silting through terracing to lower the flow of water	Silt in the dam/ retention capacity
		Livestock pollution	Provision of controlled entry points to the dam	
Construction of Ruungu water intake in Tharaka		Water abstraction is not metered. This means the exact volumes of water used for irrigation is not known	Install a master metre at the intake to measure the amount of water being abstracted	Water meter
		Loss of irrigation water due to the open canal system used. This is caused by the high temperatures in the area responsible for high evaporation and sharing of the water during the day	Complete the lining of the planned section of the open canal	Groundwater water seepage
		Loss of water through ground seepage is high due to the nature of the canal. This has contributed to the flooding of the local access roads	Share the water from 4pm to 8pm and from 5am to 9 am to reduce the amounts lost through evaporation	Water efficiency
		Ineffective soil conservation in the area has caused silting of the canals	Grow soil holding crops close to the furrows e.g. Napier grass and sugar cane to cut down on silting	Soil productivity
		Slight increase of malaria cases due to the open canals passing homesteads	Cover water canals	Reported cases of malaria
		The weir has caused the water to erode the river banks on the upper section of the resulting dam.	Increase the spill way and protect river banks through planting of grass	River bank status

Kikuyian Borehole		Potential pit latrine contamination of the borehole water human waste leading to typhoid and diarrhoea cases.	Relocate pit latrine to higher ground or same gradient with the store and watchman house.	Water quality
		Live fencing should be started since the barbed wire will not be sustainable in the long run	Exchange of council land meant for a dam site with the one adjacent to the borehole site to be watering points for the animals during dry periods when the stagnant water collected as a result of runoff dries off.	
		Oil and diesel collection may lead to spillage outside the room, which may be drained off by storm water to the natural water collection point	Establish oil collection points by raising the grounds around the generator.	Waste oil management
		Erosion will prevail if alternative site for watering of animals will not be found	Plant trees within the borehole site.	Soil erosion
		Concentration of animals and people in small half-acre plot.	Establish alternative points for livestock watering	Cattle watering troughs
		There are no records for water quality testing	Testing of the borehole water for water quality especially total dissolved solids, BOD, COD, ions and heavy metals should be undertaken and regularly monitored	Water quality /Monitoring of metals, ions, TDS, BOD, COD Silt
		Roads leading to the borehole were submerged on water.	Dig water drains along the road to drain water from flooding the road	Road and borehole drainage system

Olchorro Letuya Ole Tunya Spring		Construction of the dam has led to concentration of leeches that often harm livestock.	Catfish should be introduced to feed on the leeches which is a major problem to livestock and poses danger to human beings	Leeches
		Soil erosion on the path that lead to the spring.	Supply pipes to water the troughs should be underground	Condition of the pipes
		Animals stepping on water trough because it is very low leading to contamination	Fencing of the spring and dam site should be done immediately	Water quality & fence
		Non-separation of water troughs for cattle with goats and sheep can lead to trampling of sheep and goats.	The area surrounding the trough (earlier and current) should be dug to about 1 ft and stones/gravel poured into it to prevent erosion and wearing off of the sides of the troughs as a result of livestock trampling on it.	Water
			An additional trough, which is raised adequately, should be constructed for the cattle and leave the current one for sheep and goats.	No. of troughs
			Trees should be planted around the spring. The trees should be water friendly and adaptable to the site.	Trees planted
			Soil (raised) around water troughs both the old one and current needs to levelled off	
			More gravel needs to be put on top of the spring point and not soil as is presently	
			Supply pipes to the water trough should be buried	

Chepareria Livestock Sale Yard		Stagnant water	Draining off water that stagnates	Stagnant water
		The fence is made of posts and wire mesh which could easily be vandalized	Sale yards should be fenced with metal bars and not posts and wire mesh as this would easily be vandalized	Fence
		Poor sanitation	Provision of water to the site	Sanitation indicators
		Devegetation	Planting of trees around the site	Trees planted
Chemsik Rehabilitation Pan		Potential breeding site for mosquitoes and other water borne diseases like bilharzias	Boiling of water before consumption Introduce fish species to feed on larvae Avoid drawing water when in direct contact with the water body	Mosquito larvae
		Potential conflict over water use	Community committee in charge of water projects should be capacity build in financial, managerial, conflict resolution and environmental issues	Reported cases of conflict
		Observed soil erosion along excavates walls and immediate vicinity	Soil conservation techniques	Soil erosion indicators
		Localized soil erosion in the project site due to excessive trampling by livestock	Create watering troughs and distribute other sources	Landscape changes
Temborion Water Pan		Potential breeding site for mosquitoes and other water borne diseases like bilharzias	Use of cultural mosquito repellents like cow dung to combat malaria	Mosquito larvae
		Localized soil erosion in the project site due to excessive trampling by livestock	Soil conservation techniques	Soil erosion
		Siltation of the water pan	Create silt traps	Siltation and water retention capacity
Trefos-Kiburuti water tank		Soil piles	Use the soil to landscape the project area	Landscape

		Open trenches	Cover all the trenches to minimize injuries	Trenches
		Water use	Construct a catchment for overflow water that can be used in adjacent tree nursery	Overflow catchment tank/structure
Kaga Water project in Nyeri district		Strong winds in the project area	Plant trees to act as wind breakers	Dust and soil erosion
		Tank exposure to grazing livestock Vegetation overgrowth around the storage tank	Clear the bushes to enhance sanitation & control vulnerability to disease vectors	Sanitation indicators around the site
		Presence of cow dung all over the site	Keep cattle of the project area through fencing	Cattle dung around the tank area
Bubisa Water Project		Water contamination	Fetch water in pipes as opposed to common troughs Construct water troughs for animals some distance from the domestic water fetching points to reduce incidences of contamination from animals	Fetching from pipes Water troughs
		Aquifer depletion	Establish a trend in aquifer production yield through regular monitoring of ground water levels	Abstraction rates and quantities
Karungu Dam		Eroded embankment/ Devegetated embankment	Plant grass on dam embankments to control likelihood of water pollution and siltation	Grassed embankment that is fenced off to minimize human and animal activity.
		Livestock faecal matter around the site	Fence the dam site using barbed wire to avoid accumulation of biological wastes in the dam.	Fence
Bubisa Primary School		Plastic wastes and cans in the compound	Step up waste management concerns	Waste
		Localised impacts of scattered construction materials	Keep such materials safely for re-use	Construction waste

Manyatta Jillo Primary school in Qilta-Korma location		Dusty compound	Plant more trees in the school compound as windbreakers	Dust & Vegetation
		Rubble	Clean all the construction waste & safely keep the reusable materials	Construction waste
		Plastic wastes	Collect and burn these waste	Litter
Thirigitu- Mt.Kenya Women Group project		Scattered polythene wastes	Use the plastic matter for landfill Recycle the polythene papers for reuse	Litter
		Catchment destruction	Plant indigenous trees on the river catchments to salvage the drying river Nairobi.	Forest cover
Walda Irrigation Project		Localised soil erosion	Undertake soil conservation measures/ Establish a dry season grazing area	Soil conservation initiatives
		Competition between agriculture and livestock	Establish proper spill and overflow containment measures. Farmers should be encouraged to undertake agroforestry where they plant tree species that can be used as fodder.	Community dry season grazing areas Tree stands for fodder species
Olmelil Dam Rehabilitation and Spring Protection	Dam Rehabilitation	Oil pollution	Development of environmental management plan for oil disposal.	Oil disposal
		Mosquito breeding	Introduction of fish in the dam to feed on mosquito larvae and also as income generating activity.	Mosquito larvae

		Water contamination	<p>Regulations should be established for the use, access and management of the dam and dam catchment</p> <p>Testing of water for water quality</p> <p>Establish a tree nursery for supply of seedlings to the residents within the catchment as well as income generating activity.</p>	<p>Management committee</p> <p>Water quality</p> <p>Catchment status</p>
Gulley Erosion Control through Construction of Check Dams And Gabions In Sololo Mlimani		Rills are forming on river embankments	Plant cover vegetation on the embankments	Erosion
		Sand exposure in the project site	Fence off the areas to curb likelihood of sand harvesting	Fence
		Few tree stands along the project area	Encourage tree planting exercises by communities along the river stretch.	Indigenous tree stands planted
Kases Earth Dam			Fencing the dam	Fence
			Training of the committee before handing over	Project committee
			Prohibit cultivation on the catchment	Farms around the dam
			Planting of shrubs to hold soil and prevent erosion of dam raised sides	Soil erosion
			Reinforce more soils on the dam sides Develop de-silting plans as well as for silt traps	Silt in the dam
			Formation of a water pan committee before the project is handed over to the community	Water users association

			Establish a tree nursery for supply of seedlings and income to the residents within the catchment	Tree seedlings distributed and planed
Project	Activities	Impacts	Mitigation Measures	Monitoring
Nkando Irrigation Project		Water overflows	Channelled back to adjacent collection tank	Amounts overflowing
		Reducing water levels	Maintain the riparian reserve by planting appropriate tree species along the river	Water levels
		Scattered used material in the tank area	create awareness on waste management	
		Leakages	Detect and correct the leakages	Amounts lost
Kilimani Primary school		Devegetation through grazing and browsing livestock in the school compound	Fence the entire compound using barbed wire	Vegetation cover/grass
		Dust inhalation by school children	Plant euphorbia trees around the classes to insulate against excess dust	Dust and vegetation cover
		Water leakages from the tank	Repair the leakages	Water leakages
Bula Mpya Primary School		Open pits	Protect the water pits as long as construction is on course/Plant trees on dry water pits	Open pits
		No drinking water in the new site	Connect the new school to tap water	Supply of water
		Few pit latrines	Construct more pit latrines	Sanitation
Mosiro pump feed irrigation scheme-Mosiro location in Narok				
Construction of incinerator at Alango in Garissa	Burning of Health care wastes	Partly burnt health care wastes	Modification of incinerator to increase temperatures & efficiency	Wastes from the incinerator

			Add an additional chamber	
Kiambindu micro irrigation project in Mbeere District	Construction of water weir across the river	The weir is gradually damming the river before the weir	Increase the spillway to reduce water retention period	River bank status
	Digging of canals	Low flow downstream during dry season upstream	Reduce abstraction during dry period	Amounts of water downstream
	Canal irrigation	Water abstraction is not metered	Install a master meter	Amounts of water abstracted
Gababa water pan in Ijara District	Clearing of the land	De-vegetation around the pan	Fence the pan	Vegetation cover
	Excavation	Pollution by human wastes and livestock wastes	Site pans a distance from each other	Water
	Flooding of the pan	Soil erosion	Create a watering burrow for livestock away from the pan	Water quality
		Population influx in the area due to the presence of a water source	Plant trees around the pan to prevent soil erosion	Trees planted and erosion indicators
		Increase in prevalence of water borne diseases such as bilharzias, diarrhea and cholera	Treatment of domestic wastes from the water pan	Water borne diseases prevalence
Kasina Earth Dam in Mwingi		Pollution from communities dwelling upstream	Creating awareness to communities on the upstream situation and pollution	Water quality
		Silting of the dam due to agricultural activities around it	Prevention of silting through terracing to lower the flow of water	Silt in the dam/ retention capacity
		Livestock pollution	Provision of controlled entry points to the dam	Water quality

Construction of Ruungu water intake in Tharaka		Water abstraction is not metered. This means the exact volumes of water used for irrigation is not known	Install a master metre at the intake to measure the amount of water being abstracted	Water meter
		Loss of irrigation water due to the open canal system used. This is caused by the high temperatures in the area responsible for high evaporation and sharing of the water during the day	Complete the lining of the planned section of the open canal	Water loss
		Loss of water through ground seepage is high due to the nature of the canal. This has contributed to the flooding of the local access roads	Share the water from 4pm to 8pm and from 5am to 9 am to reduce the amounts lost through evaporation	Water loss
		Ineffective soil conservation in the area has caused silting of the canals	Grow soil holding crops close to the furrows e.g. Napier grass and sugar cane to cut down on silting	Soil erosion
		Slight increase of malaria cases due to the open canals passing homesteads	Fill up stagnant water and pits along the irrigation channels	Larvae and reported cases of malaria
Kikuyian Borehole		Potential pit latrine contamination of the borehole water human waste leading to typhoid and diarrhoea cases.	Relocate pit latrine to higher ground or same gradient with the store and watchman house.	Borehole water quality
		Potential source of water conflict	Separate points for people, cattle, and sheep and goats in order to avoid conflicts and contamination.	Watering points
		Live fencing should be started since the barbed wire will not be sustainable in the long run	Exchange of council land meant for a dam site with the one adjacent to the borehole site to be watering points for the animals during dry periods when the stagnant water collected as a result of runoff dries off.	

		Oil and diesel collection may lead to spillage outside the room, which may be drained off by storm water to the natural water collection point	Establish oil collection points by raising the grounds around the generator.	Oil management
		Erosion will prevail if alternative site for watering of animals will not be found	Plant trees within the borehole site.	Soil erosion
		Concentration of animals and people in small half-acre plot.	Establish alternative points for livestock watering	Space need for watering cattle
		Lack of water quality records	Testing of the borehole water for water quality especially total dissolved solids, BOD, COD, ions and heavy metals should be undertaken and regularly monitored	Water quality and records
Olchorro Letuya Ole Tunya Spring		Construction of the dam has led to concentration of leeches that often harm livestock.	Catfish should be introduced to feed on the leeches which is a major problem to livestock and poses danger to human beings	Monitoring of metals, ions, TDS, BOD, COD
		Soil erosion on the path that lead to the spring.	Supply pipes to water the troughs should be underground	Leeches
		Animals stepping on water trough because it is very low leading to contamination	Fencing of the spring and dam site should be done immediately	Water quality & fence
		Non-separation of water troughs for cattle with goats and sheep can lead to trampling of sheep and goats.	The area surrounding the trough (earlier and current) should be dug to about 1 ft and stones/gravel poured into it to prevent erosion and wearing off of the sides of the troughs as a result of livestock trampling on it.	Water

			An additional trough, which is raised adequately, should be constructed for the cattle and leave the current one for sheep and goats.	
		The site is bare of trees	Trees should be planted around the spring. The trees should be water friendly and adaptable to the site.	Trees
Chepareria Livestock Sale Yard		Stagnant water	Draining off water that stagnates	Stagnant water
		Potential of soil erosion on the road leading to the loading bay	The path leading to the loading room composed auction yard needs to be constructed of concrete	Soil erosion
		Poor sanitation	Provision of water to the site	Sanitation condition
		Devegetation	Planting of trees around the site	Vegetation
Olmelil Dam Rehabilitation and Spring Protection		Careless oil disposal	Collect used oil for proper disposal	Waste oil
		Breeding of mosquitoes	Introduction of fish in the dam to feed on mosquito larva and also as an income generating activity	Mosquito larva
			Planting of more trees around the dam site and the perimeter fence	Number of trees planted
		Poor management	Formation of water users association	Water management
		Poor management of water	Establish water users code of conduct	Water management
Trefos-Kiburuti water tank		Soil piles	Use the soil to landscape the project area	Landscape

		Open trenches	Cover all the trenches to minimize injuries	
Kaga Water project in Nyeri district		Strong winds in the project area	Plant trees to act as wind breakers Fence the project site to avoid trampling of the surrounding soil	
		Tank exposure to grazing livestock Vegetation overgrowth around the storage tank	Clear the bushes to enhance sanitation & control vulnerability to disease vectors	Sanitation
		Presence of cow dung all over the site	Keep cattle of the project area	
Bubisa Water Project		Water contamination	Fetch water in pipes as opposed to common troughs	Fetching from pipes
		Aquifer depletion	Establish a trend in aquifer production yield through regular monitoring of ground water levels	Abstraction rates
Karungu Dam		Eroded embankment/ Devegetated embankment	Plant grass on dam embankments to control likelihood of water pollution and siltation Create silt traps	Siltation Siltation
		Livestock faecal matter around the site	Fence the dam site using barbed wire to avoid accumulation of biological wastes in the dam.	Monitor water quality
Bubisa Primary School		Plastic wastes and cans in the compound	Step up waste management concerns	Waste management
		Localised impacts of scattered construction materials	Keep such materials safely for re-use	
Manyatta Jillo Primary school in Qilta-Korma location		Dusty compound	Plant more trees in the school compound	Dust & Vegetation
		Rubble	Clean all the construction waste & safely keep the reusable materials	Construction waste

		Plastic wastes	Collect and burn these waste	Litter
Thirigitu- Mt.Kenya Women Group project		Scattered polythene wastes	Use the plastic matter for landfill Recycle the polythene papers for reuse	Litter
		Catchment destruction	Plant indigenous trees on the river catchments to salvage the drying river Nairobi.	Forest cover
Walda Irrigation Project		Localised soil erosion	Undertake soil conservation measures/ Establish a dry season grazing area	Soil erosion
		Competition between agriculture and livestock	Farmers should be encouraged to undertake agroforestry where they plant tree species that can be used as fodder.	Water conflict
Gulley Erosion Control through Construction of Check Dams And Gabions In Sololo Mlimani		Rills are forming on river embankments	Plant cover vegetation on the embankments	Erosion
		Sand exposure in the project site	Fence off the areas to curb likelihood of sand harvesting	
		Few tree stands along the project area	Encourage tree planting exercises by communities along the river stretch.	Tree planting
Kases Earth Dam		Lack of fence to protect the dam	Fencing the dam	Fence
		Lack of awareness on management	Training of the committee before handing over	Project committee
		Cultivation in catchment area	Prohibit cultivation on the catchment	Farms around the dam
		Erosion of areas of the catchment	Planting of shrubs to hold soil and prevent erosion of dam raised sides	Soil erosion

			Reinforce more soils on the dam sides Develop de-silting plans as well as for silt traps	Silt in the dam
		Lack of water management structures in place	Formation of a water pan committee before the project is handed over to the community	Water management
		Degraded vegetation	Establish a tree nursery for supply of seedlings and income to the residents within the catchment	Tree seedlings distributed and planed

6.1 Monitoring and Evaluation Plan

Impact	Indicator	Responsibility	Method	Cost & Comments
Mosquito Breeding	Mosquito larvae Increased cases of malaria	MoH	Observation MoH Reports and statistics	To be determine by the community and METs
Devegetation	Change in vegetation cover Soil erosion	NEMA MoA/NEMA	Observation	To be determine by the community and METs
Pollution	Quality of water Increased cases of waterborne diseases	MoW	Sample testing	To be determine by the community and METs
Waterborne Diseases	Increased cases of waterborne diseases	MoH	MoH Reports and statistics	To be determine by the community and METs
Low water levels downstream	Water conflict Narrowing of riverbanks	MoW/DDC/NEMA Observation	NEMA/MoW	To be determine by the community and METs
Population resettlement	Landscape change Soil erosion	DDC/NEMA	Observation Transect walks & drives	To be determine by the community and METs
Soil salinity	Low agricultural productivity per hectare/acre over time Change in crops colour High soil conductivity	MoA	Agricultural production reports	To be determine by the community and METs
Overgrazing	Devegetation	NEMA/MoL&F	Observation/	To be determine by the community and METs
Depletion of groundwater/aquifer	Low boreholes yields Drying of boreholes in the district	MoW	Yield tests Observation	To be determine by the community and METs

7.0 Study Findings

This chapter gives a summary of the findings of the Environmental Audit Study and is based on the field site visits and data collection as well as the in depth review of the relevant literature and information provided by the ALRMP II personnel.

From the study it has emerged that ALRMP trigger two kinds of environmental impacts. The first one is localised impacts that are as a result of pressure on resources such as cattle trampling and overgrazing near water sources such as those supported by ALRMP like pans and dams. The second kinds of impacts are those that are cumulative in nature caused by numerous micro-projects depending on the same kind of resource. The activities that have such impacts include groundwater abstraction projects and surface water abstraction.

7.1 Institutional Capacity

Most of the DSGs have not had any form of training and capacity building in the following areas which remain vital in implementing environmental components of the projects namely:

- Environmental Impact Assessments
- Environmental Audits
- Monitoring and Evaluation
- Use of the Environmental Screening Form

The communities especially the management committees lack the necessary capacity in simple financial, management, conflict resolution and environmental issues.

7.2 Environmentally Sound Project Design and Siting

There is a lot of water going to waste through evaporation as a result of irrigating farms during day time when the sun hot.

Most irrigation projects use inefficient technologies that waste water through ground seepage and evaporation owing to daytime watering.

Poor siting of pit latrines could cause underground water contamination especially when near a water source or borehole as is the case with the Narok borehole project.

7.3 Use of Environmental Screening Form

Based on the review of paper trail of screening and EMP, impacts of micro projects are not identified but mitigations are recommended. However most of the projects have undergone some of environmental screening depending on the nature of the project.

While the EMF identifies the need to assess and monitor cumulative impacts of micro project at regional level, there is no evidence at the field level of this happening. This can be attributed to lack of technical data like groundwater aquifers, flow rates in most of the rivers and stream in these areas and status of natural resource base. Without baseline data of the resource base its impossible to assess the cumulative impacts of the micro projects.

Environmental Management Plan should be established before communities are handed over projects and they should be trained on it

The DSG has reported cases where the Screening Form is too generic and unable to comprehensively address all the issues related to the projects at the local situation and on the ground. Therefore a new friendly and adaptable screening checklist should be redesigned.

7.4 Adverse Environmental Impacts

All the water weirs projects audited none has a master meter to monitor the amounts of water abstracted. This in some places has resulted in downstream water users to have low volume flow due to uncontrolled abstraction upstream.

The boreholes that are powered by diesel to run the generator sets lack a comprehensive plan for managing the waste oil emanating from the generators. This is immensely becoming a potential hazard especially in relation to how the waste oil can be disposed in an acceptable and environmentally sound manner.

Most of the water projects constructed for human consumption have not been subjected to the mandatory tests on water including COD, BOD, and Heavy Metals etc as required. The water projects need to categorically get subjected to these tests before handing over to the communities.

It is claimed that water pans constructed have resulted in increase in water related diseases such as bilharzias, diarrhoea and cholera. The same applies to water pans resulting in mosquito increase thus increased in malaria prevalence in those areas

Availability of water pans has led to increase in concentration of livestock near the water points thus leading to devegetation around the pans, soil erosion and pollution of the pans through livestock droppings.

In areas like Ijara where use of pit latrines is not common, water pans are likely to be polluted by human waste during rainy season as most of the waste is washed into the pans. This has led to increase in waterborne diseases.

In cases where weirs are constructed, hardly is an environmental impact assessment done to determine the impacts of the weir and water abstraction downstream. This has resulted in some cases claims of low water flow to communities downstream.

Lack or inadequate information on resource status such as groundwater has led to a situation where a project is planned without the necessary data to guide in the design. There is inadequate information on amounts of surface and groundwater available in ASALs, their distribution and quality.

While we attempted to assess the cumulative impacts of micro projects on the environment, a detailed study should be undertaken in areas of ground water due to boreholes abstraction, irrigation projects and pans.

7.5 Natural Resource Management and Development

Development agenda in the ASALs have always focused on promotion and development of water and livestock. Although this is the main source of livelihood in the ASALs, the arid and semi arid areas of Kenya have many more natural resources that can foster development. The wildlife and forests in the ASALs are some of the natural resources that can be harnessed for development and to cushion the pastoralists communities against effects of drought.

Natural Resource Management component of the project has not come out strongly in the community project. This can be attributed to lack of NRM personnel at the district levels and concentration of NRM activities to water and soil. NRM is more than water and soil. There is lack of product diversification in terms of NRM projects and services.

8.0 Study Recommendations

Based on the study findings we have proposed several measures that would aim at improving the beneficial impacts of the project in the ASALs and improve project compliance to the World Bank's environmental and social safeguards as well as the Kenya's environmental legislative framework. The recommendations proposed below are as a result of consultation with the project implementation team in the districts and the community involved. The recommendations are summarised in this section but a comprehensive and detailed recommendations are found in the EMP section of this document.

8.1 Training and Capacity Building on Environmental Assessment and Management

It is strongly recommended that the training and capacity building in the following areas be accorded to the ALRMP District Steering Group and the Project Management Unit. The study has found out that staffs from the DSG and PMU are not trained on undertaking Environmental Assessment and ensuring compliance. This is in the overall effect compromising the quality of the screening forms that they are supposed to fill. Training of the DSG and PMU in the following areas is therefore recommended namely:

6. Environmental Impact Assessment for CDD type of projects
7. Environmental Auditing for CDD type of projects
8. Environmental Monitoring for CDD type of projects
9. Environmental Management and Coordination Act
10. Environmental Screening

The local communities implementing the projects also need capacity building on environment and in areas of conflict resolution among others. Specific training in the following areas is required for the local communities namely:

6. Awareness and sensitisation on the EMCA and general environmental issues
7. Training on simple book keeping and financial management
8. Training on conflict resolution
9. Training on Organisational Development and Group dynamics.

Capacity of communities implementing water related projects should be enhanced so as to enable them form effective Water/River Users Associations and provided for in the Water Act. Training of the communities on routine operation, repair and maintenance of the generator plants is also highly recommended.

Since most the projects were implemented when the districts didn't have DEOs, it is recommended that the posted officers should re-look into some of the projects that have been highlighted in this report to provide the necessary advice on how to mitigate and improve their environmental performance

8.2 Environmentally Sound Project Design and Siting

The environmental audit study has ascertained that some of the adverse environmental impacts experienced from the ALRMP II are as a result of poorly thought out design and siting of the projects that do not factor in environmental concerns at the design stage. For this reason there is need to ensure and incorporate Environmentally Sound Design of projects at the design stage to avert potential adverse impacts.

During the design stages of the community projects, the technocrats at the district level should aid the community in the designing of the projects to improve the efficiency

To improve the efficiency of the incinerator in Garissa, redesigning is necessary. A second chamber should be included and aeration chamber be introduced.

The pit latrine in Narok was poorly sited and if ESDM was applied then the pit latrine would have been properly sited to avoid possible contamination of underground water.

8.3 Use of Environmental Screening Form

The environmental audit study has found out that the already designed environmental screening form is not being filled as required. The study has realised that because the form provides for simply checking off and answering YES or NO, the form is generally abused with several instances where the form is simply filled as NO. Training in providing intellectual depth while filling the forms by the DSG is vital and needs to be embarked upon with immediate effect.

The environmental screening form is too generic and borders more on the identification of the bio-physical effects to the expense of the socio-economic impacts. The screening form should be customised to suit the needs of the community micro projects undertaken in the field. In order to achieve this, a consultative forum of field staff should be involved to review and customise this form as they have the hands on experience with what can work and what cannot work. Already some districts like Narok and Garissa have customised the form while ensuring that the key requirements and objectives are not altered.

8.4 Mitigation of Adverse Environmental Impacts

The study has identified a number of adverse impacts from the several projects audited and has proposed the following mitigation measures.

1. There is need to complete the lining of the planned section of the open canal to reduce the imminent seepage of water that is causing wastage.
2. Irrigation of crop irrigation should be undertaken when there is least loss of water through evaporation to reduce loss of water and increase efficiency of the system. Watering should for example be shared from 4pm to 8pm and from 5am to 9 am to reduce the amounts lost through evaporation.
3. Water rechanneling canals should be constructed in the irrigation canals to redirect the excess water back to the river. This will prevent the perennial problem of flooding of the roads and adjacent lands.
4. For water abstraction projects/weirs, there is need for all the projects to have a master metre installed at the intake to measure the amount of water being abstracted. This is more so a requirement by the Ministry of Water and Irrigation and the water Act. The meter will help determine the sustainability and cumulative impacts of weir along a particular river
5. There is need to grow soil holding crops close to the open furrows e.g. Napier grass and sugar cane to cut down on siltation rate which compromises the overall performance of the furrow system and increases the need for dredging.
6. To prevent loss of vegetation cover and soil erosion around the water pans, fencing of the pans using local shrubs or vegetation is highly recommended.

7. Before commissioning construction of weirs on rivers and streams, an environmental assessment should be undertaken to determine the impacts of the project on other water users downstream.

8.5 Natural Resources Development and Management

The project need to promote the development and management of ASALs natural resources including wildlife, dryland forests, rangeland which has been for a long time been neglected. The traditional development agendas of water and livestock should be complimented by these resources that have a potential of bringing development to the area.

Promotion of ecotourism and cultural tourism as well as non timber forest products should be part of the mandate of the NRM/DM component

The NRM component of the project should invest more in management of *prosopis juliflora* through utilization of the invasive species for economic as well as environmental development. Through collaboration of ALRMP, ICRAF and KEMFRI, innovative ways of using the species should be promoted as a means of improving the arid and semi arid lands.

8.6 Further Studies

There is need for Strategic Environmental Assessment (SEA) for Districts Strategic Plans, ASALs policy and Arid Lands Resource Management Project Strategic Plan to assess the environmental implications of the plans and policy on the fragile and not well understood ASALs. The SEA should establish acceptable radius between pans, boreholes and weirs.

ALRMP should commission a study on impact assessment to determine the impact/benefits of the project on livelihoods, natural resource management, development, drought and socio-economic status of the target ASALs communities.

An underground water resource survey should also be undertaken to know the limits and constraints of developing or depending on groundwater resources in ASALs. This study will guide the sustainability of groundwater extraction and identify cumulative impacts of groundwater development in ASALs as well as monitoring of the resource.

The natural resources (forests, wildlife, soils, water, etc) status of the ASALs should also be assessed to determine the status and trends in ASALs

9.0 Project Best Practices Guide

This chapter highlights the best practise guidelines which can be utilised by the ALRMP II when implementing projects of similar nature so as to minimise the adverse environmental impacts of CDD type of projects. The best practise guidelines have been developed by undertaking a detailed reference of best practise materials and guidelines developed by Canadian International Development Agency (CIDA), USAID/REDSO and the CIANEA best practise guidelines and ESDM for Small Scale Community Driven Developments. The guidelines are generic but are able to guide the user on the issues to watch for when implementing certain types of CDD activities and mitigation measures to take thereafter.

The ALRMP personnel can improve on these practices as they get experience from the designing and implementation of community based small scale activities.

GUIDANCE FOR IMPACTS AND MITIGATION MEASURES FOR ROAD PROJECTS

Rural access roads can have a positive impact to the lives of rural communities. Such projects will improve trade and communication in areas where mode of transport is mainly non-motorized. Rural roads projects can have both positive and negative social and environmental consequences. Roads projects normally require at least an Environmental Review, and if a major road improvement or construction program is planned, a full Environment Impact Assessment is normally required. New roads through previously undisturbed forest can result in increased logging, wildlife destruction, charcoal production and clearance for agriculture.

What is the possible impacts of the project on the...	Potential impacts	Possible Mitigation measures
Physical Environment? Soils	Erosion from increased run-off Loss of top soil at burrow site	Protection of soil surface for resspreading Construction in dry period Revegetation Slope stabilization Use high quality murrum Minimize amount of clearing Install permanent erosion protection (cutoffs, check dams, culverts) Use less intrusive labor based techniques. Appropriate placement of drainage off runs Refilling burrow-pit with the original top soil and revegetating
Water Resources	Increased sediment into streams, rivers etc Clogging of drainage works causing damming	Construction during dry season Construction of cutoff drains, culverts Ensure borrow pits are contoured Revegetation of cut slopes
Biological Environment?		

Natural Habitats	Disturbance of natural habitats Disturbance to protected areas	Alternative sites Restore disturbed areas Minimize amount of clearing	
Plants	Opening up of wilderness/fragile/ sensitive areas Disruption or destruction of wildlife Threats to rare and endangered species through increased trade	Avoid/reroute from wilderness/fragile/ sensitive areas Minimize loss of species Ban on wildlife products trade Traditional ban/cursing (declaration on hunting of wild animals	
Animals	Increased road kills Threats to rare and endangered species through trade or on game meat	Animal crossing signs Avoid/reroute from fragile/wilderness/ sensitive areas	
Social Environment? General beauty/ Scenic value Historical/ Cultural sites	Marred landscape Construction debris Disturbance of sites Disturbance to structures Opening up of cultural sites STI from camp crew time	Restoration of vegetation Clean up of construction Alternative alignment/reroute away from sites Special protection Off site camp	
Human Health Population	Transport of hazardous substances Traffic accidents Pedestrian accidents Disease spread from stagnant pools Population increase Disruption of traditional way of life	Regulation of transport materials Safety designs and signs Provide for auxiliary infrastructures	

**GUIDANCE FOR IMPACTS AND MITIGATION MEASURES
FOR LIVESTOCK SALE YARD**

Livestock trade is an important activity in ASALs and forms part of the economic activity in rural areas which is normally informal. Here waste from livestock trade, the grazing during the trade often leads to waste without proper management leading to water pollution and unhygienic conditions and erosion due to vegetation trampling and overgrazing.

What is the possible impacts of the project on the	Potential impacts	Possible mitigation measures	Reference materials
Physical Environment? Soils	Soil compaction and erosion	Vegetative (planting of vegetation cover)	
Water Resources	Water contamination Nutrient load	Waste management facilities (drains, compost pits etc.) Site away from water bodies	
Air Quality	Odour, breeding ground for flies and bacteria	Site away from settlements or downwind Bury waste	
Biological Environment? Natural Habitats	Disruption of natural habitats [especially aquatic habitats]	Environmental sanitation Manage waste on site (waste facilities) bury waste	
Plants	Destruction of aquatic flora through pollution	Collect waste for composting	
Animals	Spread of livestock diseases Conflict among the animals (e.g. dogs and scavengers)	Veterinary inspection Proper disposal of waste Fencing	

GUIDANCE FOR IMPACTS AND MITIGATION MEASURES FOR BRIDGES AND FOOT BRIDGES

Bridge projects just like roads are meant to ease trade and communication between communities. Such projects can have substantial socioeconomic benefits to a community. At the same time they can create enormous environmental problems.

What are the possible impacts of the project on the...	Potential Impacts	Possible mitigation measures	Reference materials
Physical Environment? Soils	Degradation of river banks Deforestation	Erosion protection Physical stabilization	
Water Resources	Creation of stagnant water Increased sediments in streams Decline in water quality Changes in hydrological regime Introduction of hazardous waste Swirl pools	Construction during dry season Bridge/channel alignment to reduce pools	
Air Quality	Dust during construction	Sprinkling water to minimize dust generation	
Biological Environment? Natural Habitats	Disturbance of natural habitat	Careful siting	

GUIDANCE FOR IMPACTS AND MITIGATION MEASURES FOR RIVER SAND HARVESTING

Sand harvesting is an income generating activity in rural areas, which supports many families but has cumulative negative impacts on the environment. This activity supports a big building industry in both rural and urban areas but mostly it is the rural people who feel the impact in terms of degraded water resources.

What is the possible impacts of the project on the	Potential impacts	Possible mitigation measures	Reference materials
Physical Environment? Soil	Degradation of river banks Soil erosion Soil compaction by trucks	Protection of riverbanks with embankment/buffer Central loading site and road design	
Water Resource	Destabilize water channels Saline water intrusion Flow alteration Increased turbidity Suspended sediments and siltation	Leave time for replenishment/alternate Construct embankments on the banks Avoid harvesting close to the banks Harvest during low flow	
Air Quality	Dust generation	Watering dry surface	
Biological Environment? Natural Habitat	Damage to riparian ecosystem Destruction of habitat zone e.g. breeding grounds	Avoid vegetated riparian areas Support operations located outside riparian areas	
Plants	Destruction of aquatic flora	Harvest instream avoid river banks	

GUIDANCE FOR IMPACTS AND MITIGATION MEASURES FOR PIT LATRINES

In areas with no sewer system, pit latrines are commonly used method for human waste disposal. Projects that improve sanitation have a positive impact on the environment, but they can have some potentially negative aspects. For example, poorly located latrines can contaminate water sources Pit latrines can contaminate both ground and surface water through infiltration or seepage if sited or designed poorly.

What is the possible impacts of the project on the...	Potential impacts	Possible mitigation measures	Reference materials
Physical Environment? Soils Water Resources	Contamination of subsurface water resources through seepage Avoid areas with high water table	Site away from water sources Training on maintenance of septic Apply non seepage technology in areas with high water table Use eco san technologies instead of pit latrines	
Air Quality	Odor	Site appropriately Use ventilated improved pit technology	
Biological Environment? Natural Habitats	Pollution of wetlands through underground seepage of nutrients from latrines Contamination of aquatic habitats		

Plants Animals	Eutrophication Loss of aquatic life		
Social Environment? General beauty/ Scenic value	Unpleasant odor	Odor-control technology in design e.g. ventilators, application of ash	
Human Health	Vector disease transmission Accident risk during construction Disease spread from contaminated water.	Use appropriate technology in designing Exercise care and caution Sanitation and hygienic program Operations and maintenance plans	
Human Communities Biological Environment? Natural Habitat	Disturbance of natural ecosystems	Alternative site away from sensitive ecosystems	
Plants	Loss of terrestrial flora and fauna.	Tree planting around fenced borehole	
Animals	Overcrowding of livestock around water point	Fencing, construction of water troughs away from borehole	
Social Environment? General beauty/ Scenic value	Marred landscape during and after construction	Landscape the area using overburden soil	

Human Health	Vector breeding e.g. in the case of stagnant water.	Environmental sanitation, revegetation, filling pits	
Population	Migration/Immigration or resource use conflict	Spatial distribution Establish water user committees Capacity building of WUAs	

GUIDANCE FOR IMPACTS AND MITIGATION MEASURES FOR BOREHOLE DRILLING AND OPERATION

Projects that provide clean water can contribute greatly to the human environment. However the benefits of providing clean water can be undermined by poor sanitation or hygiene practices that contaminate the water either at the water source or at some stage along the water chain. For this reason water supply projects should always include a sanitation/hygiene component that is implemented simultaneously with the water component. Underground water harvesting is the most common supply of water in areas that are not connected to piped system. Borehole drilling and operation need to pay attention to sanitation to protect the source from contamination and degradation.

What is the possible impact of the project on the...	Potential impacts	Possible mitigation measures	Reference materials
Physical Environment? Soils	Earth disturbance Overburden soils erosion Soil compaction around the site Soil erosion	Landscape Designate footpath and roads Revegetation	
Water Resources	Over harvesting Degradation during abstraction or development. Alteration of hydrological regime Pollution of underground water	Resource use control Resource studies Construct watering points away from source Rehabilitation of regime Fencing the borehole area Rehabilitate platforms	
Air Quality	Dust during drilling	Watering to control dust	

GUIDANCE FOR IMPACTS AND MITIGATION MEASURES FOR RESTOCKING

Environment concerns related to livestock include over grazing, pollution of watercourses and transmission of disease to humans and wildlife. Creation of new watering points for livestock can concentrate animals in given area, interfere with traditional rotational grazing patterns and lead to environment destruction in the surrounding area. Over-grazing degrades the rangeland as preferred species are selectively grazed out of existence and ultimately the carrying capacity of the rangeland is reduced. It also leads to soil erosion from wind and water as soils are stripped of protective vegetation. Rangeland is generally a common property resource that can be over used if no regulation mechanisms are in place. Small scale animal husbandry can be on commercial basis or a subsistence activity and may include a variety of livestock. Impacts of these activities on the environment may be diverse.

What is the possible impact of the project on the...	Potential impacts	Possible Mitigation measures	Reference materials
Physical Environment? Soil	Removal of soil cover Soil erosion Soil compaction	Rotational grazing Planting grass cover Planting trees Pasture establishment and management	ENCAP/ CIDA
Water Resources	Pollution and degradation Siltation of water bodies Fence domestic water source	Waste management Spread watering points Formation of corridors-	
Air Quality	Odor Methane production Depletion of ozone layer	Dung management for composting	
Biological Environment? Natural Habitat	Habitat destruction through grazing and watering	Zero grazing Paddockging Zone grazing areas	

Plants	Destruction of seeds and vegetation	Controlled grazing
Animals	Disturbance of breeding grounds of wildlife	Demarcate grazing areas
Social Environment? General beauty	Bare landscape Exposed ground Cattle tracks	Revegetation Pasture establishment and management (Range management)
Human health	Spread of diseases to humans contamination of domestic water by animal waste.	Collect animal waste for composting

**GUIDANCE FOR IMPACTS AND MITIGATION MEASURES
FOR SMALL-SCALE IRRIGATION SCHEMES**

The main problem facing the region is food insecurity. Irrigation is one of the many ways of addressing this problem and ensuring adequate food supply by growing crops off-season. Irrigation technology has its share of environmental consequences.

What is the possible impact of the project on the...	Potential impacts	Possible Mitigation measures	Reference materials
Physical Environment Soils	Increase in soil erosion Soil water logging as a result of improper drainage Increased salinization Increased leaching of nutrients	Extension and training in crop selection and agricultural technology Determine water quality for irrigation Nutrient recycling e.g. composting Maintenance of irrigation infrastructures Use of adequate water for leaching salts	ENCAP
Water Resources	Water quality degradation in ponds and reservoirs Deoxygenation of receiving water Clogging of canals from weeds Sedimentation Degradation of water systems Depletion of aquifers from over-exploitation Disturbances to flow regimes Waste/inefficient water use Competing water uses	Control of agrochemical use proper design of canals Regular canal clearing and cleaning Alternative water source such as rainwater harvesting, storm water retention. Proper design of irrigation channels Proper technical design	

Biological Environment? Natural Habitats	Disturbance of natural habitats Disturbance to protected areas	Consideration of alternative site	
Plants	Disruption or destruction of Flora	Replantation Install water meters to monitor amounts of water abstracted Consider downstream water users to prevent conflict	
Animals			
Social Environment? Human Health	HIV/AIDS Risk of waterborne diseases (schistosomiasis, malaria, etc.) Disease vector breeding Toxicity of pesticides	Establishment of health education programme and centre Establish domestic water supply Integrated pest management	
Human Communities	Conflicts over water use	Community consultation	

**GUIDANCE FOR IMPACTS AND MITIGATION MEASURES
FOR SPRING/ WATER CATCHMENT PROTECTION**

Rural folks depend on springs for water and to improve this supply communities protect or develop this resource. Spring protection is subject to competing water demands or contamination that may create environmental sanitation problems that did not exist before.

What is the possible impact of the project on the...	Potential impacts	Possible Mitigation measures	Reference materials
Physical Environment? Soil	Degradation of soil cover Erosion Epidemic outbreaks	Protection during construction Revegetation Chlorination Develop alternatives i.e. roof catchments	
Water Resources	Contamination Overexploitation of aquifers Creation of stagnant water pools Changing water table	Protection from livestock Site away from settlement Proper drainage Sanitation program/ Education and awareness.	
Biological Environment? Natural Habitat	Disturbance of natural habitat	Sitting	
Plants	Loss or degradation of vegetation	Protect vegetated areas	
Animals	Disruption or destruction of wildlife	Alternative site	
Social Environment? General beauty/ Scenic	Marred landscape	Clean up	

value	Debris	Rehabilitation	
Human Health	Waterborne diseases	Sanitation programs	

GUIDANCE FOR IMPACTS AND MITIGATION MEASURES FOR CATTLE TREKKING ROUTES

Cattle routes ease transportation of livestock to markets as well as to watering points enabling communities that are not served with motorized transport to take their products to market. These informal socio-economic infrastructures plays important role in pastoralist communities livelihood.

What is the possible impact of the project on the...	Potential impacts	Possible Mitigation measures	Reference materials
Physical Environment? Soils	Loss of soil cover Soil compaction Soil erosion	Alternative siting. Alternate routes seasonally to avoid permanent effects	
Water Resources	Siltation of water bodies Degradation of watering points	Fence and protect watering points Spread watering points to reduce pressure on one point	
Air Quality	Dust generation	Form/Tree planting on sides of foot path (fencing-live)	
Biological Environment? Natural Habitats	Destruction of habitats or sensitive areas.	Site the route away from wilderness	

ALRMP Phase II Annual Environmental Audit

Plants	Trampling of vegetation		
Animals	Displacement of wild animals	Site the route away from wildlife areas	
Social Environment? General beauty/ Scenic value	Marred landscape Cattle tracks		
Public Health	Spread of both human and livestock diseases.		

HEALTH PROJECTS (CLINICS, DISPENSARIES, CENTERS)

Health projects often consist of a combination of activities, some of which have an environmental risk and some of which do not. Capacity building, education, training and awareness activities have no environmental risk. But activities such as construction of health centers and disposal of healthcare waste pose environmental risks that should be considered in project planning. The issues associated with construction of health care facilities are similar to those for other building construction and are discussed above. Any project providing health care facilities (dispensaries, clinics etc) should always provide for disposal of healthcare waste, even if funds are limited. Health care waste can pose serious environmental risks and is discussed in the next section below.

Disposal of healthcare waste

Health care waste is hazardous and can poison people, animals and wildlife. It can consist of infectious material, pathological material, chemicals, pharmaceuticals, sharps, blood and other infections body fluids, stools from patients with cholera or other forms of diarrhoea, and other forms of waste. If funds are scarce, simple low-cost methods can be used which greatly reduce the environmental risk such as open air burning, simple brick or drum incinerators, or safe burying. Sources of further information on safe disposal methods are listed in the references

What is the possible impacts of the project on the...	Potential impacts	Possible mitigation measures	Reference materials
Physical Environment? Soils	Loss of soil cover Soil erosion Poor waste disposal	Reestablish soil by planting trees and other vegetations Proper landscaping Awareness on waste disposal	
Water Resources	Point and non-point source Contamination Poor waste disposal	Site away form water sources Training on waste disposal	
Air Quality	Dust generation Noise	Use water to suppress dust	
Biological Environment? Natural Habitat	Opening up of closed areas	Avoid or protect closed habitats	

Plants	Destruction of vegetation	Rehabilitation/Revegetation	
Animals			
Social Environment? General Beauty/ Scenic value	Marred landscape	Plant bananas on mined areas Landscaping	
Human Health	Accidents Mined areas create burrow pits that attract vectors e.g. mosquitoes	Fence off mined areas to avoid accidents Refill created pits	

**GUIDANCE FOR IMPACTS AND MITIGATION MEASURES
FOR WATER PAN**

Water Pans is an important source of domestic and livestock water in ASALs. Environmental concerns of Water Pans include breeding ground for mosquitoes, waterborne diseases, soil erosion due to concentration of livestock, pollution of water, concentration of human settlements and destruction of vegetation

What is the possible impact of the project on the...	Potential impacts	Possible mitigation measures	Reference materials
Physical Environment? Soils	Soil/earth disturbance Soil erosion	Landscape	
Water Resources	Pollution Quality alteration Sediment due to silt	Protect pan from pollution Create silt traps	
Air Quality Biological Environment? Natural Habitat Plants Animals	Destruction/disturbance of natural habitat Encroachment to sensitive ecosystems Loss in vegetation Introduction of aquatic life Interference with migratory species Introduction of alien species Use indigenous fish species	Site away from sensitive ecosystems such as wetlands Site away from sensitive ecosystems Revegetate depleted areas Alien species control measures	
Social Environment? General beauty/ Scenic value Human Health	Marred landscape Prone to flooding Introduction of water-borne diseases	Restrict areas cleared for pans Site ponds away from flood prone areas Design good drainage	

Population	Migration/Immigration Conflicting demands on water use	Use fish species that feed on disease carriers Ensure proper sanitation Development control measures Site ponds away from traditional water use
------------	---	--

SCHOOLS AND EDUCATION PROJECTS

The training and capacity building elements of school programs normally have no environment impact unless the subject matter is concerned with aspects of environment management, in which case the current best practice should be adhered to. Many schools projects involve construction or rehabilitation of buildings in which case the guidelines for construction projects given above should be followed. If provision of water and sanitation facilities is planned, the guidelines on water and sanitation below should be followed.

- Are waste management facilities included in the building construction plan?
- Is the location of the waste management facility satisfactory?
- Does the health facility have a written waste management plan?
- How much and what kind of waste will be generated? How much hazardous waste will be produced?
- Are the proposed sanitation facilities adequate?
- Who will be responsible for waste management at the facility?
- What are the current waste management practices at such facilities in the region?
- To what extent will waste affect the learners and the community

Mitigating measures

- Include waste management facilities as part of the plan.
- Develop a waste management plan.
- Clearly define management responsibility for waste handling.
- Train staff in waste management & storage, handling, treatment and disposal.
- Use waste segregation procedures.
- Site the facility so that it has access to clean water, but does not contaminate water sources.
- Install adequate sanitation facilities.
- Chose a location where waste can be safely buried or burned.
- Avoid locations near schools.
- Teach pupils, staff and community members, waste management procedures.

GUIDANCE FOR IMPACTS AND MITIGATION MEASURES FOR HAND DUG WELLS

In areas with shallow water table and soft alluvial deposits, hand dug well can be a source of water to community. This type of water project does not require sophisticated technical input or equipment and therefore common method of harvesting underground water in remote areas.

What is the possible impact of the project on the...	Potential impacts	Possible Mitigation measures	Reference materials
Physical Environment? Soil	Compaction of soil around the well		CIDA source book
Water Resources	Depletion of groundwater table Disrupt the hydrology Ground water contamination Degradation of areas around the well	Provide alternative sources of water to reduce pressure on the well Cover the well properly Fence and protect the well from animals Plant vegetation around a well	
Biological Environment? Natural Habitat	Destruction of natural habitat		
Plants	Loss of vegetation	Protect the areas around the well Revegetation	
Animals	Injuries, especially to domestic animals Drowning	Cover the well Establishing watering troughs away from the wells	
Social Environment? Landscape			

Human Health	Increase in diseases vectors	Employ good drainage around water points	
Population	Increase in population	Develop other sources to reduce pressure on one source Distribute equally water points to ease congestion	

Reference

Administrative Geographic and Physical Description of various districts from development plans.

ALRMP 2003. Arid Lands Resource Management Project: Project Implementation Plan

ALRMP 2005. Situational Analysis on Completion of Micro-projects

ALRMP II 2006. Case Studies. Good and Bad Implemented Projects 2003-2006 from 22 ALRMP II Districts

ANECT 2005. Arid Lands Resource Management Project II: Annual Environmental Audit

GoK 2005. Arid Lands Resource Management Project II: Strategic Plan (2005-2009)

GoK 1999. Environmental Management and Coordination Act, Government Printer Nairobi Kenya

GoK 2003. Environmental Assessment and Management Framework. Arid Lands Resource Management Project Phase II

GoK 2005, Draft National Land policy. Ministry of Lands and Housing

GoK 2005. Draft National Policy for the Sustainable Development of Arid and Semi Arid Lands of Kenya

GoK Annual progress report of Mwingi district (July 2005 to June 2006). Prepared by the drought management officer, Francis Koma

GoK. 2005. Ijara District Vision and Strategy: 2005-2015

GoK. Annual progress report of Mwingi district (July 2005 to June 2006).

GoK/ALRMP 2005. Natural Resources Management Sub-Component: Progress Report for the Period July 2004-June 2005

GoK; Arid and Semi-Arid Lands (ASALs) National Vision and Strategy; Natural Resource Management (2005-2015)

GoK; Arid Lands Resource Management Phase II; Environmental Management Plans for Turkana District; (2003-2005)

GoK; Arid Lands Resource Management Project II; Strategic Plan (2005-2009)

GoK; Arid Lands Resource Management Project Phase II; Marsabit District; Environmental Impact Mitigation

GoK, Monitoring Report for February 2006 (scheduling and reporting sheets for the period September 2003-february 2006 micro-project and sub-projects)

GoK; Arid Lands Resource Management Project Phase II; Natural Resources Management sub-component; Progress Report for the period July 2004 to June 2005

World Bank, 1991. Environmental Assessment Sourcebook, Vol. I Policies, Procedures, and Cross-Sectoral Issues

Appendix

A. Training Curriculum

Training of Trainers course on integrating environmental awareness into project activities

Objectives

1. To be able to sensitize the communities on the importance of the environment.
2. Create awareness on the importance of the environment among communities in the project area.
3. Outline the linkages between the various development projects e.g. water and resource use management and dry land farming and environmental degradation.
4. Highlight the impact of man's activities on the environment.
5. Draw a link between disease prevalence and water quality and hygiene practices.
6. Provide feasible and workable solutions to environmental problems in the project areas.

Training Programme

Day one:

Session one

Introduction

- Provide a background to the environmental situation of the district over the last 2 decades.
- Highlight the changes that have occurred since the last two decades both at the local and the national level.
- The kind of attention given to the issues relating to the environment vis-à-vis other issues.
- The changes in the communities' perception of the environment and its importance.

Session two.

Group plenary.

Environmental problems in the district and their causes

Guiding Questions

- How could you describe the districts environmental status? What are the scenarios in the Eastern flank, central corridor and the western side and riverine area?
- What are the major environmental problems affecting the district?
- What are the major factors behind the environmental problems in the district?
- To what degree do poor people have control over decision-making on environmental matters of immediate concern to them?
- What are the communities' perceptions of these problems?

Session three

Group work presentations.

Day two:

Session four

Group Discussion

Impacts of development activities on the environment.

1. What are the impacts of the water project on the environment?

Guiding issues.

- The impacts of dry season watering points on the environment.
- How does the development and use of wet season watering points like the water pans impact on the environment and natural resource use, conservation and management?
- How does the role of gender affect the utilization of the natural resources?
- What are the impacts of human activities on the wet season water sources?
- How does the community perceive these problems?

2. What are the impacts of the dry land farming activities on the environment?

Guiding issues.

- Extent of soil erosion
- Mushrooming settlement
- Flooding
- Salinization and water logging
- Nutrient depletion.
- How does the role of gender affect the utilization of natural resources?
- How does the community perceive these problems?

Session five

Panel presentations.

Session six

Solutions to the environmental problems associated with the project.

Guiding issues.

- What can be used as the entry points for addressing environmental problems?
- What are the mechanisms that the community has used to address the environmental issues of concern in the past? e.g. Cultural practices.
- How can we address these environmental issues in the current context? I.e. what are the existing opportunities for intervention?
- How can we establish links between natural resource depletion and poverty? E.g. nutrient depletion leading to falling yields.
- How we integrate the environmental issues of concern into the project training activities?

Day three

Session seven

Group presentations.

Session Eight

Evaluation and the way forward.

- What gaps can we identify that can be addressed both in the long and short terms?
- What are the priority issues for action in the future?

Guiding issues

- Possibility for a district wide environmental needs assessment.
- The need for mass community mobilization and awareness.

Integrating environmental management into drought preparedness projects

This training curriculum integrates environmental management into the development projects activities under the ALRMP. The course has seven major components to be covered in a three-day seminar hand in hand with related issues in water management, livestock keeping and dry land farming.

1. Introduction

Environment

This includes a definition of the meaning of environment, which should include anything that surrounds a human being including human beings themselves, the vegetation, air water, and all other living and nonliving things.

An attempt should also be made at defining **environmental protection, environmental conservation and environmental management**. Though the three are almost geared towards the same things, their difference and relationship and the one(s) that are more applicable to the local community needs to be highlighted.

2. Human activities and the environment

In this component various relationships between man and the environment that have a direct consequence for poverty should be explained. This should include the following:

- Population increase and its impact on the environment, which should include change and rapid increase in consumption patterns. This should be tied to the change in the vegetation cover in the area and the environment on a general scale.
- The impact of the changing activities of nomadic pastoralism on the environment. Issues covered include the impact of large herds of livestock on the environment and the tendencies by some people to cut down important vegetation to provide browse for their livestock during the dry season.
- The haphazard development or mushrooming of settlements and urban centres and their impact on the environment. Issues for discussion include environmental sanitation, deforestation, catchment degradation, degradation of important grazing land and range block management. Such questions as; how can these be controlled in the future in light of the government policy or how can be addressed at the moment? Should form part of the discussion.
- Natural resource management: The major issues for discussion should be conflict over natural resources and the fencing off of prime grazing lands by few individuals while locking out the rest of the community and its impact on the environment. Mechanisms for resolving such issues and how to mitigate them in the future needs to be discussed.
- Food aid and external intervention and its consequences for the environment. The training should address such issues as the apparent shift from self-dependency to the current dependency syndrome on external intervention and food aid and its resultant effects on the environment. Such issues as degrading the environment through the cutting down of trees to provide building materials for sale and felling of trees to provide charcoal for sale to survive when external intervention is withdrawn have serious consequences for the environment.

3. Development of water resources and environment.

Issues covered under this component include:

- Providing water versus environmental protection
- Seasonal water resources and the management of the surrounding environment.
- Permanent water resources and the management of the environment and pasture areas.
- Anticipating environmental problems associated with the development of water resources and how to mitigate them.

4. Dry land farming and the environment.

- Mitigating environmental problems associated with dry land farming.
- Improving food security and enhancing productivity versus environmental protection.
- Conserving the environment for improved crop production.

5. Environmental management for sustainable development.

- Formation of village environmental committees with a mandate on environmental management, hygiene sanitation and environmental awareness creation.
- Formulation of by-laws to govern the use of natural resources.
- Integration of traditional resource management practices and modern conservation practices.

2. Managing polythene

- Effects of polythene on livestock and the environment.
- Slapping a ban on its use and importation.
- Recycling its waste to prevent it from being consumed by livestock and children.

3. Managing Prosopis

- Effects of prosopis on the environment
- Considering alternative uses of charcoal such as provision of charcoal, fencing material etc.
- Destroying it by cutting it completely.

B. Environmental Review Screening Form

Project Information

Screening carried Out: Yes/No

Contact:

Contact's Title and Division:

Contact's Phone: Fax:

Project Information

Project Title:

Description of the Project:

Component

Location:

Impacts identified

Mitigation Measures undertaken

Provide a brief description of the project objectives and activities

Provide a brief description of the project site and surrounding geographic area. Specify any geographic characteristics of the site (e.g. topography, seismicity, hydrology, etc.) that may affect the mitigation measures of the project.

Rationale for the Project:

Environmental/Site Information

Description of the Project's Environmental Setting/Location:

Will the project be located in or near a geographic area designated for environmental protection including, without limitations, national parks, tropical rainforests, and wetland, World Heritage Sites or World Biosphere Reserves?

Current Land use of Site and Surrounding Area:

Anticipated Environmental Effects

Provide a brief description of the project's potential to:

- a. generate significant air emissions, liquid effluents, wastes or noise;
- b. demand significant resource requirements (energy, materials, water, land); and
- c. result in significant adverse social impacts.
- d. resource competition
- e. result in soil degradation (salinity, compaction, etc) or erosion
- f. result in recurrence of vectors or health effects

Will the project result in any relocation of human settlement?

Describe how the environment may impact on the project.

Proposed Mitigation/Enhancement

Describe how the above negative effects were/can be mitigated and/or positive ones enhanced.

Public Participation

Describe any public consultation the proponent and or host community have undertaken.

List any Supporting Documentation, Date Included

May include previous assessments, site maps, and records of consultations.

Influence

Describe your role and level of influence in the project with respect to design, construction and operating responsibilities, where applicable.

Collect samples

Sample 1 Soil

Sample 2 Water

Sample 3 Any other

C. Terms of Reference

Introduction

The Arid lands Resource Management Project in the Office of the President is funded by credit from the World Bank and is operational in 22 Arid and semi arid districts of Kenya. The project targets 5.8 million people and works through three inter-linked components namely Natural Resource and Drought Management, Community Driven development and support to local Support to local Development. The three components will be implemented in 11 arid districts while the first component will be implemented in all the 22 ASAL districts beginning October 2003.

The extent of the ALRMP II in terms of geographical area is 85% of the total Kenya land mass. The area is inhabited by a diversity of target communities and the project activities are staggered to reach as many of them as possible.

The project is involved in designing and applying methods of Early Warning System, food security monitoring, drought preparedness and mitigation initiatives based upon sound knowledge on the potentials, constraints and opportunities of the natural resource base with a set of governmental policies, legislations and program planning strategies. It is envisaged that all these initiatives will be undertaken in collaboration with various stakeholders in partnership to reach more populations and have a multidimensional impact.

A Participatory development of a vision for the ASALs involving all key stakeholders will be an important starting point for rolling project interventions based on this framework. All project planning and management activities would revolve along the developed framework integrating natural resources and environmental management.

Background

The project development objective is to enhance food security and reduce livelihood vulnerability in drought prone and marginalized communities in 22 ASAL districts. The project was designed to strengthen and support community driven initiatives through three inter-linked components to achieve the stated objective.

The Natural Resources /Drought Management component aims to mitigate the risk posed by drought and other factors by strengthening and institutionalizing natural resources and drought management systems.

The components will contribute to enhancing knowledge and awareness of Natural Resource Management issues at community, district and national levels through supporting capacity building to increase awareness of the constraints and potentials of their natural environmental building upon traditional knowledge and complementing with modern science.

An improved awareness of the scientific and administrative context will enable communities to improve Natural Resource Management at the local level.

At the district and national level, the component will support the collection and analysis of information of existing natural resource management at the local.

At the district and national level, the component will support the collection and analysis of information of existing natural resources and production systems as well as ecological trends. Building upon and complementing previous Research, projects and programs implemented in the ASALs. The data collection activities will feed into the development of a monitoring of ecological "hot spots" to be managed through the Discrete Development Areas Approach.

Alongside the above activities, ALRMP II has prepared an Environmental Management framework that details potential environment impacts, mitigation measures, M& E for all activities undertake and capacity and capacity building of all participating stakeholder at the community, district and National levels.

Objective of study

- To review that performance of the ALRMP II in integrating natural resources and environmental management and mitigation measures into the operation of the project , and make practical recommendation for improving performances
- To ensure and record compliance monitoring
- To identify cumulative effects
- To provide learning lessons for continuous performance improvement.

Tasks

- Reviews the paper trail of screening checklists and EIA reports, and review of reports on wider of natural resources and environmental management;
- On the basis of this review, select a number of community micro-projects and sub-projects for field visits to investigate compliance with proposed mitigation measures and identification of potential impacts that are not being adequately identified or dealt with by METs, communities or District Officers;
- Recommend practical improvements to the EMF screening in order to fine tune the operation of the EMF based on practice experience,
- Discuss ALRMP activities in natural resources and drought management planning with PCU , NRM officer , Drought Management Officers , District Environmental Officers;
- Recommend additional assessment studies to be carried out to complement development of the project's approach to natural resource and environmental management.

Outputs

A report of the annual performance review delivered to the PCU, NEMA and the World Bank, setting out:-

- Summary of the numbers of the micro-projects and inter –community projects
 - i. carried out
 - ii. screened for environmental
 - iii. provided with technical advice from METS
 - iv. assessed with a full EIA etc
- Description of the actual operation of the EMF as it occurred in practice;
- Identification of environmental risks that are not being fully addressed or mitigated;
- Conclusions on whether the project is maximizing its positive contribution to natural resources and environmental management;
- Areas of improvement and practical recommendations.

Implementation

The stud will be carried out by a team of consultants in collaboration with National and District level ALRMP staff. the district to be covered are Moyale, Garissa, Ijara, Mwingi, Tharaka, Mbeere, Kieni, Narok, Isiolo, Marsabit ,Liakipia, Baringo, West Pokot and Trans Mara .

Time frame

The exercise will be undertaken during the next eight (8) weeks.

D. Contacted Persons

1. Mr Masila	Agriculture and Crop Production Officer, Tharaka
2. Mr. Gichuki	District Irrigation Engineer, Tharaka
3. Joseph Nthiga	Project chairman, PO Box 10 Marimanti
4. Samwel Kilonzo	Committee member P. O Box 10 Marimanti
5. Mr. John Mugao	Committee member PO Box 10 Marimanti
6. Hassan Dubow Hussein	Chairman, Community Development Committee (CDC) Garissa
7. Kahiye Iman.	Community nurse and procurement sub committee member Garissa
8. Saadi Noor	Community Development Project Officer, Garissa
9. Mohammed Dahir	Drought Monitoring Officer, Ijara
10. Mr. Mbaraku	Drought Monitoring Officer, Mbeere
11. Frances Koma	Drought Monitoring Officer Mwingi
12. Ismael Duale Ahmed	Mobile Extension Team, Garissa
13. Hussein Somo	District Environment Office (DEO), Ijara
14. Abdi Affey	Community Development Project Officer (CDPO), Ijara
15. Adan Hussein Dubow	Chairman of Community Development Committee, Garissa
16. Mr. Lordman	Community Development Project Officer (CDPO), Isiolo
17. Mr. Abdikhadir	Community Development Project Officer (CDPO), Moyale
18. Mr. Wanjau	Supplies and Procurement Assistant, Moyale
19. Mr. Godana Doyo	Drought Monitoring Officer, Marsabit
20. Mr. Julius Muriuki	Drought Monitoring Officer, Laikipia
21. Mr. Micheni	DATA, Nyeri
22. Mr. Julius Akena	Community Development Project Officer (CDPO), Baringo
23. Mr. John Mwangi	Drought Monitoring Officer, Narok
24. Mr. Ann Ollolombwa	
25. Mr. Kariuki	Drought Monitoring Officer, West Pokot.
26. Mr. Valerian Micheni	Nyeri
27. Mr. Kanyotu wa Mwai	Nyeri
28. Mr. Valerian Micheni	Nyeri
29. Mr. Kanyotu wa Mwai	Nyeri
30. Mr. Peterson Githinji	Chairman Kaga Water Project:
31. Mrs. Joseph Mwangi	Vice Chairman Kaga Water Project:
32. Mrs. Agnes Wamuyu	Secretary Kaga Water Project:
33. Mr. Cornelius Mureithi	Treasurer Kaga Water Project:
34. Mr. Moses Mureithi	Committee Member Kaga Water Project:
35. Mr. John Muriuki	Committee Member Kaga Water Project:
36. Mr. Ture Boru	Isiolo
37. Mr. Sako Jillo	Isiolo
38. Mr. Abubakar	Isiolo
39. Mrs. Amina	Isiolo
40. Mrs. Asha Ramata	Headmistress Bula Mpya Primary School
41. Mrs. Amina Ramata	Extension Officer
42. Mr. Mamo Boru Mamo	District Environment Officer, Marsabit
43. Mr. Moses Mama	Committee member, Marsabit
44. Mr. Abdille	Marsabit
45. Mr. Halakhe Isaiya	Moyale
46. Mr. Abdulahi	Team Leader, Moyale
47. Mrs. Dima Bonaya	Team Leader, Moyale
48. Mr. Okotu	Chairman, Walda Irrigation Project:
49. Mr. Halakhe	Secretary Walda Irrigation Project:

- | | |
|---------------------|--|
| 50. Mr. Ali Bonaya | Member Walda Irrigation Project: |
| 51. Mr. Guyono | Member Walda Irrigation Project: |
| 52. Mr Guyo | Area Chief Walda Irrigation Project Area |
| 53. Moses Igogo | Water Officer, Narok |
| 54. Joseph Karangu | District Irrigation Officer, Narok |
| 55. Jeremiah Nyugah | Water Officer, Narok |
| 56. James Siameto | Fisheries Department, Narok |
| 57. Simon Weru | District Environment Officer, Mbeere |

E. Water Samples Results